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Railway Age

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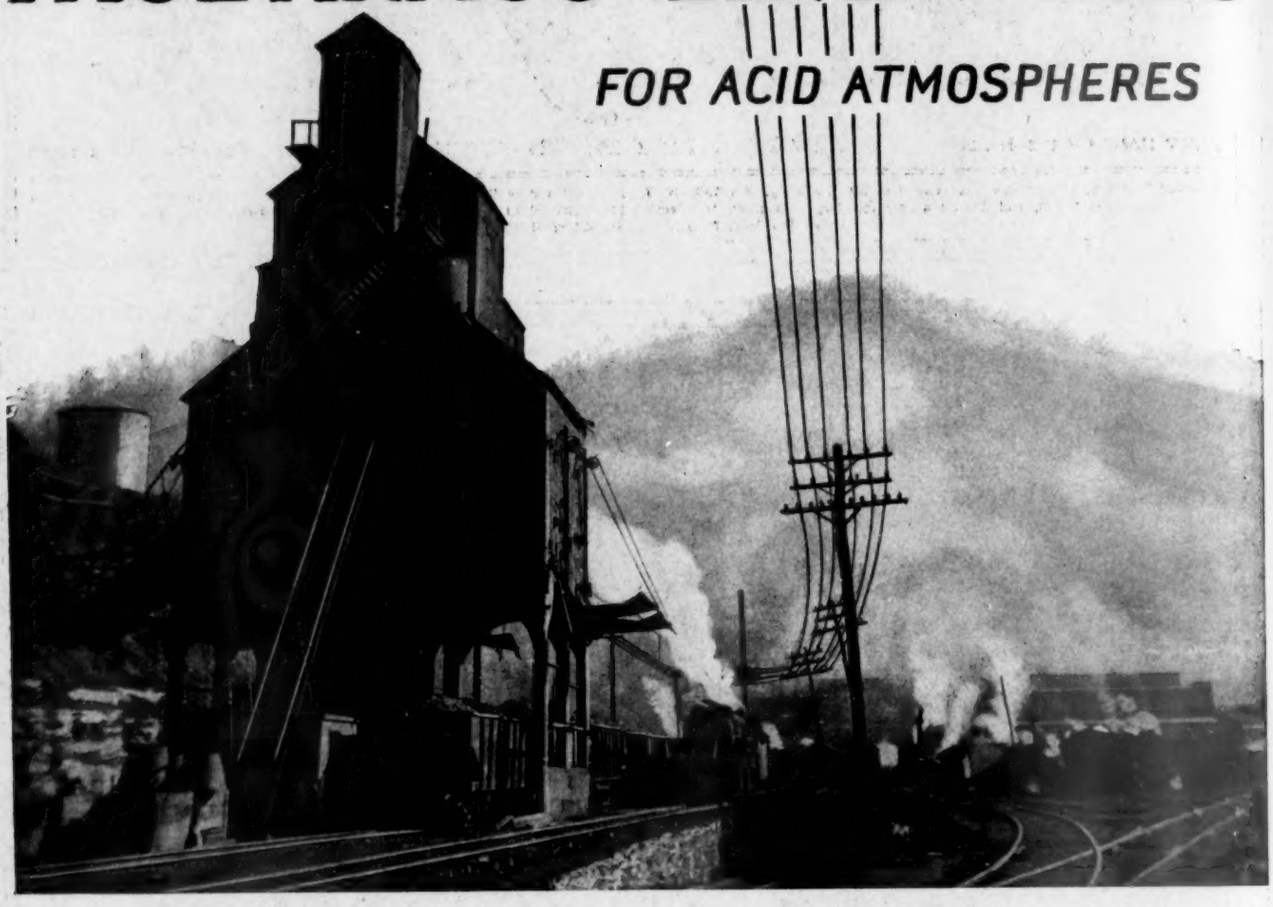
PAGE-ARMCO LINE WIRES

FOR ACID ATMOSPHERES



THE corroding acid atmospheres produced by the smoke and gases from railroad yards and congested manufacturing districts soon have their effect on steel wires and so called "iron" wires, making necessary their frequent renewal, which is expensive.

Page-Armco Galvanized Line Wire is Pure Iron. The Purest Iron made (99.84%). The impurities taken in the aggregate do not exceed 16/100 of 1% when considering silicon, sulphur, phosphorus, carbon, manganese, copper, oxygen, hydrogen, and nitrogen.

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Page-Armco Wire under the same conditions will outlast steel wire three to five times.

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INGOT IRON

EDITORIAL

Railway Age

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The foremen, chief clerks and other subordinate officers form a direct link between the rank and file and the management.

Inspiring the Supervisory Forces

It is the duty of these officers to interpret the policies of the management to the men and to keep the management informed as to the needs and feelings of the men. The first requirement demands a considerable amount of attention on the part of the management to the training, coaching and inspiring of the supervisory officers. Has this requirement been thoroughly recognized and given a proper amount of attention? Is it not true that an organization will be successful to the degree to which its officers possess real qualities of leadership? Has sufficient attention been given to the development of these qualities, particularly for those supervisory officers who come in direct contact with the rank and file? Have we not made a mistake in assuming that qualities of leadership were a natural gift and did not require the same educational effort in their development as does manual skill or professional work? A man may have lying dormant all of the qualities needed for a highly skilled mechanic or an engineer or physician, but unless these qualities are carefully developed toward these ends they are useless so far as these particular things are concerned. Does not the same thing apply to qualities of leadership? These comments are suggested by the paper by I. U. Kershner before the New York Railway Club on foremen's clubs; it will be found elsewhere in this issue.

The 1956 locomotives now on order for delivery by the manufacturers in the next few months, plus the 1228 which were

Are We Ready for Them?

delivered during the first four months of the year, will call for an extensive redistribution of power by the time that the railroads are confronted with the maximum traffic movement this fall. The effect of such redistribution on the requirements of locomotive terminal facilities in the way of longer roundhouse stalls and turntables has presumably been given adequate consideration, at least it is a common subject of discussion. But whether equal attention is being given to the effect of increased trainloads as the consequence of revised tonnage ratings, particularly on the secondary lines receiving the power supplanted by the placing of the new locomotives on main lines, is to be questioned. Not infrequently the inadequate length of passing tracks or yard leads is not realized until the locomotives are delivered or transferred, with the result that full advantage of the greater tonnage rating cannot be fully realized. Unfortunately the problem is not just one of increasing the length of existing tracks. In many cases, the longer trains simply serve to aggravate what is already an unsatisfactory situation. Where a train on the siding now blocks three highway crossings, the longer train may block four, or the time that the crossings are blocked or the time lost by the train in cutting for the crossings is increased. In other words, the resulting condition may be such as to call for the construction of a new passing track outside of urban limits. This, in turn, brings up questions as to the location of coaling and water stations, the relation of the passing tracks to points where road trains are required to do considerable switching, etc. But, whatever the difficulties, they should be anticipated now insofar as is practicable in order that remedial measures may be instituted in advance of these requirements.

The plan under which the Italian government will lease portions of the state-owned railways to private companies has

Italy's Private Operation Plan

been announced. Leases will be of 30 years' duration with an option of cancellation by either party after 15 years. The government will undertake to turn over to the concessionnaire an adequate supply of rolling stock and three months' stores. The government will guarantee a minimum gross revenue per kilometer of line. All revenue derived from operation is to go to the concessionnaire except that reserves of 5 per cent of gross revenues must be set up to meet claims for damages, renewals and retirements. The state will share in company dividends only when they exceed 7 per cent on the company's paid-up capital. At the end of the concession half of the company's reserve funds, which may not exceed the share capital, are to go to the government. The amount of stock is to be prescribed for each concession and no increases will be possible without the sanction of the government. Since line, stations, shops—all railway property—are to be turned over to the concessionnaires rent free, except for the government's participation in earnings over 7 per cent, capitalization will not be high. Few restrictions will be placed on the companies in dealing with labor. Altogether the plan seems highly favorable to the concessionnaires, showing to what length the government and the people are willing to go to rid themselves of government operation. Indeed so great is the desire of the government to be relieved from the onus of operating the railways that it does not demand that the concessionnaires be of Italian nationality; on the contrary it would welcome foreign capital and foreign management. It is reported that a number of British capitalists are interesting themselves in the matter. The news from Rome shows how untrammeled private initiative, which is so unpopular with a certain body of public opinion in this country, has been accepted as the remedy for the ills of government operation. Applying Italy's experience to our own railroad problem, might we not well avail ourselves of the remedy before the disease becomes so serious?

There is no question but what railroad managements recognize the necessity of improving their engine terminals

Financing Engine Terminal Improvements

in order properly to care for the larger and more powerful locomotives which have been, and are being, placed in service. To finance such improvements, however, it is necessary to find new money; this has been particularly true in recent years when net earnings have been so greatly reduced. The credit of the roads has also been affected to a degree which makes it difficult to raise money. It has been much easier to finance the purchase of the cars and locomotives themselves because of equipment trust certificates. There did not seem to be any way, however, in which this same principle could be applied to the purchase of fixed facilities. Special in-

terest, therefore, is attached to the announcement in this issue that a means has been found to circumvent this difficulty and that a company has been formed to finance the purchase of engine terminal equipment along much the same lines as the trust agreements for the purchase of cars and locomotives.

Begin to Plan for a Centennial

There is every reason to believe that the railroads of America should celebrate their hundredth anniversary within the next five years. That they will not see fit to do so is inconceivable. To borrow from colloquialism, the railroads will pass up one of the best bets ever offered them or placed within their reach if they do not seize upon this opportunity and utilize it to the fullest degree. We hear a great deal in these days about the trials and tribulations of the railroads. We talk vigorously and long about the forces and tendencies that retard their proper development. We think we know the secret of some of the failings charged against transportation at the present time and believe we can prescribe the proper remedy in many cases. We generally agree that the mental attitude of the worker and particularly the attitude of the public is a fundamentally important factor in the consideration of the railroad question. We are convinced that if the workers took more pride in their work and the public understood the railways better than it does, the railroads would be in better condition, their future would be brighter and the public itself would have less occasion to clamor for the service which it cannot expect to get under present conditions. There seems to be common agreement among all who have given this question consideration that a celebration of the one hundredth anniversary of the establishment of railway transportation will contribute greatly to inspiring the rank and file of the workers with the worth of the institution they serve and in impressing the public with a greater appreciation of the railway problem than it has now. But there is one thing which should be remembered. Talking and interest alone will not put a celebration over. There is much planning to be done, much organizing, many difficulties to be overcome. For the railroads to undertake a centennial celebration is for the railroads to undertake a big job and big jobs are not undertaken at the last minute. With the centennial as with other things, we can procrastinate, but we ought not to procrastinate. If a centennial celebration is worth undertaking, let the railways decide to undertake it, when to undertake it, and how to undertake it while the season is young.

The Maintenance Department's Part

While the program adopted by the American Railway Association for the movement of the season's peak traffic this fall is directed largely towards the repair and utilization of cars and locomotives, it also calls for the full co-operation of the maintenance-of-way department in so conducting its work as to complete those operations which tend to interfere with the movement of traffic before September 1, when the heaviest movement usually begins. While not as evident, the contribution which this department can make is just as direct as that of any other department. In the first place, its demands upon equipment for work-train service, for the hauling of ballast and for other purposes, is heavy. It is evident that the diversion of cars and locomotives to such work when revenue traffic is awaiting movement reduces the capacity of the road to that extent and that the reduction of these demands to the minimum, as requested by the American Railway Association, is consistent with the obligation of the railways to their patrons. In the second place, many of the activities of the maintenance-of-way department, such as the laying of rail and the renewal of bridges, lead to slow orders and other delays to traffic which may reduce the capacity of a line when its ability to handle traffic is already taxed to the limit. The concentration of work on those projects which affect the capacity of the roads either directly or indirectly in an effort to complete them and remove these limitations on capacity before the maximum rush comes will constitute a service to the road and increase its ability to render service accordingly. There is still another way in which the maintenance-of-way department can add to the capacity of a road, namely, by bringing its tracks and structures into the best possible condition. Not only will this reduce the number of derailments with their resultant confusion and interruption to traffic, but it is well known that the improvement in the condition of track permits heavier train loading or the more rapid movement of the same tonnage. In planning for the movement of the peak load expected this fall, operating and maintenance officers can well afford to co-operate in so scheduling the work to be done as to give preference now to those projects which necessitate the greatest amount of interference with traffic and in developing methods for the conduct of this work which will reduce the amount of this interference to the minimum and leave for the fall months that work which will not interfere with traffic and can be postponed until then without undue disadvantage. The present situation calls for teamwork of the highest character in which the maintenance-of-way department can play an important part.

Locomotive Terminal Facilities

Plans for handling a larger volume of anticipated traffic always suggest the acquisition of additional locomotives and generally those of increased tractive force. In anticipation of probable requirements, many roads recently have placed orders for new power, but early deliveries can no longer be secured from orders not yet placed. Another direction of attacking the problem is to put as many as possible of the locomotives owned in good operative condition. With this in mind, the American Railway Association is endeavoring to secure a reduction of 15 per cent by October 1, 1923, of the number of locomotives held for heavy repairs. A third way in which the desired results may be obtained is to increase the number of miles per day per locomotive owned. This means not only reducing to a minimum the number of locomotives being overhauled at any one time, but an increased utilization of the locomotives in actual service. Although considerable may be gained at certain points by increasing the length of locomotive runs, the problem thus presented is fundamentally one for the locomotive terminal to handle. Even with the best possible management—and present conditions call for a high degree of ability and judgment on the part of enginehouse foremen—the available facilities may be almost hopelessly inadequate. There can be no question in regard to the real need for a higher standard of locomotive terminal facilities at most points. The more important terminal should, of course, be given attention first. Local transportation facilities are frequently far from ideal. Hand trucking is an expensive way to use labor and delays incident thereto may considerably reduce the efficiency with with which skilled labor is utilized. Power trucks or tractors and trailers will materially expedite the work and only limited expenditures are ordinarily necessary in providing improved passage-ways and thoroughfares to make their use highly profitable. Another frequently glaring need is that for a greater number and more modern types of machine tools. Until such machine tools can be secured, relief may often be obtained by systematically making semi-finished parts of as wide a variety as possible at the central shops and carrying such parts at the various enginehouses. The

time saved in fitting such parts over that necessary to finish them from the rough condition may make possible a much quicker return of a locomotive to service. Whatever plans are made for the betterment of railroad facilities, the great and ever-increasing importance of the locomotive terminals and their equipment should not be overlooked.

Concerning Railroad Consolidations

THE *Railway Age* published an editorial in a recent issue deprecating the use of the argument in favor of the consolidation of the railroads into a limited number of systems that very large economies would thereby be effected. The Des Moines Register, commenting on this editorial in its issue of May 3, said: "There is no reason to believe, of course, that there will not be a working economy under existing conditions in big consolidations." It stated, however, that "It is not primarily economy of operation that is stirring the agitation for consolidations into big systems, but getting some 75,000 miles of 'lame duck' roads hooked up with the powerful roads, so that railroading as a whole may be at least self-sustaining." It concluded its comments by asking: "What is the *Railway Age's* own proposal for the 'lame duck' roads?"

We believe that the merit, or want of merit, of any program of railroad consolidation depends mainly upon two things: First, the grounds upon which it is advocated, and, secondly, the purposes it is intended to accomplish. We are opposed to the use of the argument that large economies would be effected merely by consolidating the railroads into a comparatively few big systems, because we do not believe it would have this result. If it would not, the use of this argument tends to mislead public sentiment in a way that will hinder the solution of the railroad problem.

There is no question whatever that past consolidations of many small railways into the existing systems usually have resulted in increased economy of operation and improved service to the public. But it does not follow, because the consolidation into one railway of several railways each having only a few hundred miles of line has been beneficial, that the consolidation of all lines into a few systems each having a huge mileage and business will be beneficial. Perhaps it would be; but some real and substantial evidence in support of the theory that it would be should be advanced before the theory is adopted as the basis of a very important governmental policy.

If it be true that, other things being equal, increase in the size of railway systems increases economy of operation, then it ought to be possible to demonstrate a relationship between the size of our existing railway systems and their economy of operation. Can this be done?

The best single measure of relative sizes of railroad systems is not mileage of line, but total earnings, which are a resultant both of mileage of line and density of traffic handled. There are several measures which may be applied to the railways to determine the relative economy of their operation. One of these is the ratio of their total operating expenses to their total earnings, which shows how many cents a railway spends to get each dollar of its earnings. We have divided the 45 railway systems of the country having the largest earnings into three groups of fifteen systems each. The fifteen largest roads have total earnings from $110,000,000 to $695,000,000 a year. The roads in the second group have total earnings from $38,000,000 to $96,000,000 a year. The roads in the third group have total earnings from $9,000,000 to $31,000,000 a year. The average operating ratio of the group composed of the railways with the largest earnings in 1922 was 79.2. The average operating ratio of the second group of roads was 78.6 per cent. The average operating ratio of the third group was 80.3.

Another measure of relative economy of operation is the ratio of a road's purely transportation expenses—the expenses incurred in making up, moving and breaking up trains—to its total earnings. The average transportation ratio of the group of roads having the largest earnings was 38.7; of the second group of roads, 39.5, and of the third group of roads, 38.6.

It has often been claimed that consolidations of railways into a few large systems would save large amounts of the money spent for management, which are included in "general expenses," and for the solicitation of traffic, which are included in "traffic expenses." The general and traffic expenses of the fifteen largest railways in the country in 1922 amounted to 4.1 per cent of their total earnings; those of the next fifteen largest roads to 4.2 per cent, and those of the next fifteen largest roads, to 5.5 per cent.

It is from these statistics, and other statistics and facts that might be given, as well as from general observation of railway operation, that the *Railway Age* has drawn the conclusion which it has hitherto stated, viz., that there is little or no evidence that large economies would result from consolidating all the railways into a few large systems. A common mistake made in discussing the question of consolidations is that of assuming that all the so-called "weak" roads are small railways, that they are weak because, owing to their smallness, they cannot be economically operated, and that they could easily be got rid of and their weakness converted into strength merely by consolidating them with large railways. The fact is, that some of the largest railway systems of the country must be classed as "weak," while numerous small railways must be classed as "strong." The fifteen largest railways in the country included three roads so weak that in 1921 and 1922 they fell far short of earning the interest on their bonds. They include three other roads which could not pay dividends on common stock and still another which paid modest dividends on its common stock mainly from its surplus, because it did not earn enough to pay them. These seven big roads, all of which must be classed as "weak," make more than one-sixth of the total earnings, and have almost one-sixth of the total mileage of the country. At the present time the number of "weak" systems with total earnings in excess of $100,000,000 a year is relatively as great as the number of "weak" roads having earnings of $10,000,000 to $100,000,000 a year.

While the *Railway Age* cannot, from such facts as the foregoing, draw the conclusion that consolidations of all railways into a few systems can logically be advocated upon the ground that they will lead to large economies, we nevertheless believe that a program of consolidations would, in the long run, be beneficial to both the railways and the public, if it was adopted to accomplish objects which are not only desirable, but feasible, and was carried out solely to accomplish those objects. There are still hundreds of small railways all over the country which are indispensable to the communities they serve, but which cannot, at present, compete successfully with the larger railways, or even earn enough money to live. It is desirable, in the public interest, that most of these shall be merged into larger systems.

Furthermore, the existence in the same territories of "weak" and "strong" roads, whether large or small, has for years presented, and still presents, a problem which must be solved in some way if the broader railroad problem of the country is to be solved. It has been, and still is, impossible to fix the rates in any territory in such a way as to enable the "weak" roads to earn enough adequately and satisfactorily to serve the communities on their lines, without at the same time enabling some roads to earn returns which the regulating authorities and the public, whether reasonably and fairly or not, regard as excessive. The framers of the Transportation Act sought to remedy this condition in two ways. One was that of requiring that one-half of the earnings in excess of 6 per cent on its valuation made by any railway in a year should

be paid over to the Interstate Commerce Commission. The other was that of directing the Interstate Commerce Commission to make a plan for the consolidation of the railways into a limited number of competing systems of substantially equal earning capacity.

There are wide differences of opinion among railway executives regarding the wisdom of this part of the policy of the Transportation Act. On the whole, the *Railway Age* has believed, and believes now, that it is sound. We believe that government regulation should encourage a program of consolidation of railways. This should not be done with the idea that it will result in effecting large economies in operation—although some economies undoubtedly will be effected by a reasonable policy of consolidation—but with the object of bringing about greater uniformity in the earning capacity of the various railway systems, and, also, of improving transportation service, especially that rendered to the people who must now rely chiefly or entirely for services upon "weak" lines. This seems to be the only feasible way to get rid of the "lame ducks" and render it practicable to secure a system of rate regulation that will enable most or all of the railways to earn reasonable net returns.

It is not necessary, however, for the attainment of objects that are both desirable and feasible, to consolidate all the railways into, say, twenty systems which would have an average of about 13,000 miles of line, and average earnings of about $300,000,000 a year. There are at present only three systems in the United States which in 1922 had total earnings exceeding $300,000,000. Even the Canadian Pacific, with its huge mileage, does not earn this much money. To throw all the railways of the country together in a short time into twenty systems would be to present to the managements of most of these systems problems of organization and administration of the first magnitude. It seems not improbable the immediate result would be an increase rather than a reduction of operating costs.

Furthermore, it is a fact which most people who discuss this question seem to overlook that the new railway systems formed must grow in trackage, in capacity of equipment and terminals, in traffic handled and in earnings if they are to handle the constantly growing business of the country. In all the elements which constitute size the new railway systems would in a comparatively few years be twice as large as when formed, and with every increase in their size the problems of organization and administration would become more complex and difficult. Nobody can intelligently anticipate what would be the ultimate effects on the railways and the public of adopting a policy which should, in effect, force all the railways to consolidate within a short time into, say, twenty big systems.

The problem presented by the existence of "weak" and "strong" roads in the same territories can be as well solved under a plan of consolidating all the railways into forty systems as under a plan of consolidating them into twenty systems. There are cases where, to eliminate large "weak" roads it would be necessary to consolidate them with large "strong" roads, and this would make some very large systems. But there are other cases where large railways and small railways could be so consolidated as to remove "lame ducks" from the field. There are still other cases where two or three small roads could be so consolidated as to accomplish this purpose. The nation does not have to commit itself now to a policy of forming a few huge systems in order to solve the problem presented by the existence of weak and strong lines in the same territory, and it should not commit itself to such a policy until better reasons for it have been advanced than have been offered thus far.

One fact of very great importance which ought never to be overlooked, but which very commonly is ignored, is that in almost every case where consolidations would strengthen weak roads they would also weaken strong roads. The railways of the country as a whole in 1921 and 1922 earned an average net return of only about 3.6 per cent, and for ten years the average net return earned by them as a whole has been entirely inadequate. There are still some railway systems whose earning capacity is sufficient to enable them, even in years of depression, to go forward with improvement and expansion programs. If, however, the railways were all consolidated into a comparatively few systems, each made up of what are now "weak" and "strong" roads, all these new systems, unless the railways were regulated differently from the way they have been for at least ten years, would soon be weak systems not one of which would be able to expand and improve its facilities and enlarge and improve the service rendered by it to the public. The transportation situation of the country can be improved by carrying out a reasonable program of consolidation, but only if this is accompanied by the adoption of a policy of regulation of rates which will make all these consolidated systems strong systems, and not weak systems. The country would better have some weak and some strong railways than no strong railways at all.

Adjusting Signaling Traffic

THE HEAVY TRAFFIC now being handled offers an excellent opportunity to study the efficiency of the existing signaling as a means of expediting train movements, and every indication points to a continuance of this record business for the remainder of the season. The signal engineer is ordinarily a system officer and, therefore, cannot be expected to be acquainted with all of the local operating difficulties brought about by the congestion resulting from the increased traffic. In such cases the division superintendent may well invite the signal engineer to co-operate in investigating the delays to trains on grades, near terminals or at other points of congestion. For example, the relocation of a water station, or the necessity for holding long freight trains clear of certain highway crossings while locomotives run for coal and water, may indicate the advisability of relocating or adding a signal to protect such trains without causing unnecessary delays to following trains.

An increased number of switching movements at the end of a yard or the more frequent use of a siding may cause too many unnecessary train stops for following trains on a grade at a signal that could perhaps be moved or another signal installed, so as to keep the following trains moving. Also where the number of trains closely approaches the track capacity on the longer grades, where movements are necessarily slow, one or two additional intermediate signals may assist materially in expediting the movement over this section and clear up the congestion on the entire district.

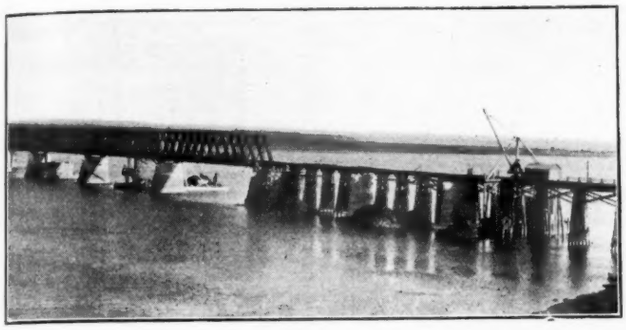
Again the remote control switch machine for passing tracks has introduced striking economies where installed on many roads. While its advantages may not yet have been brought to the attention of many operating officers, the possible savings warrant its joint investigation by operating and signal officers with a view to applying it at certain points.

Ordinarily, the reasons for many delays may not be apparent. However, if the signal engineer will co-operate in the study of this problem with a view to suggesting those signal improvements or changes that will increase the track capacity promptly, the operating officers can secure action on the matter at once. It is only by such concentrated investigation of these local problems of congestion now, that the losses can be detected and the measures selected which will eliminate the continuance of this drain on revenues promptly and at small cost. As there is yet time to make these changes that will assist materially in moving the heavy traffic this year, signal engineers, division superintendents and higher officers in charge of expenditures, may well determine what action should be taken at once on minor changes or additions that are so evidently needed now.

Use Pneumatic Process for Twelve Bridge Piers

Rebuilding of Union Pacific Structure Over the Columbia River Gives Rise to Some Interesting Problems

THE USE OF DIAMOND CORE DRILLS for the investigation of old concrete masonry and the application of the pneumatic process for the construction of twelve piers comprising the entire substructure of a bridge across the Columbia river at Kalan, Wash., are among the interesting features of a project now being carried out on the Yakima line of the Union Pacific (Oregon-Washington Railroad &



The Old Bridge. Work in Progress on the New Piers

Navigation Company). Another noteworthy feature is the fact that the new bridge replaces a structure built only 12 years ago by the North Coast Railroad, a property acquired by the Union Pacific shortly after its construction.

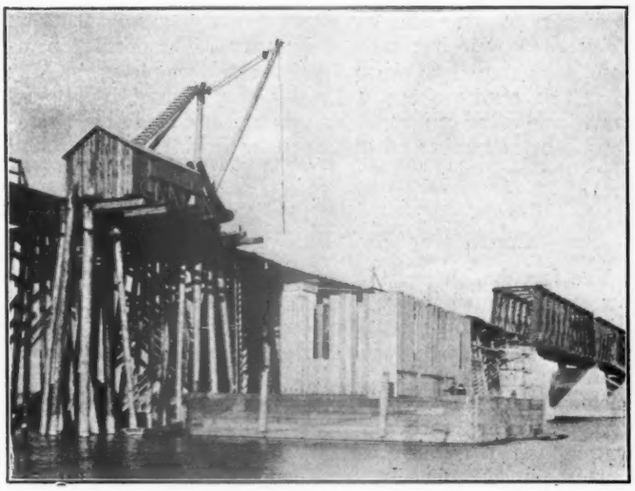
The original bridge consisted of nine 155-ft. through Howe truss spans and a 244-ft. Howe truss swing span with trestle approaches of 447.5 ft. and 503.5 ft. on the east and west ends, respectively. The trusses were supported on concrete piers. At the time of the original construction, in 1909-1910, it was assumed that the timber superstructure would have a life of 8 to 10 years, and

The Mixer Plant

experience demonstrated that this estimate was substantially correct. But in the course of studies for the purpose of determining the most suitable type of construction to replace the original spans, it was found that the substructure was in a condition that did not present a sufficient degree of security or permanency to warrant its use as the support for a new steel superstructure. This fact, together with the depreciated condition of the timber of the superstructure, made it advisable to suspend operation over the bridge until it could be replaced by a new structure. This could be done without serious inconvenience because of the presence of another bridge across the Columbia river only a few miles from the Kalan crossing.

Old Piers Not Carried to Rock

One of the most interesting phases of this project is to be found in a study of the foundation conditions and the marked contrast in the method by which the problem of obtaining secure footings for the bridge piers was attacked in the course of the renewal program as compared with those pursued in the original construction. The bed of the river at the bridge site presents a gray basalt bed rock, bare in some places and covered elsewhere with from 6 to 12 in. of volcanic ash and a stratum of sand and large boulders of varying thickness to a maximum of about 20 ft. At the



A Stiff-Leg Derrick Handled Timbers for Erecting the Caissons in a Pontoon

time of the original construction, exploration of the river bed was restricted to the driving of some test piles which led to the use of pile foundations for the four easterly piers where the cover over the rock is of appreciable thickness. In the case of the other piers the piles were omitted. All of the piers were constructed inside open timber caissons which were sunk to the river bed by weighting them with rails, and then filled with concrete, but without attempting to unwater them or make any effort at excavation. Obviously this procedure did not carry the foundations to the rock surface, but this had not been deemed necessary because it was assumed that the material overlying the rock was a gravel and sand in a "cemented condition." That there was some question as to the security obtained in this manner is evidence to the fact that a considerable quantity of riprap was placed around each of the piers.

The true condition of these old piers was ascertained in connection with recent studies for renewal by core borings driven down through the piers from the top, which not only disclosed the varying thicknesses of loose material between the bottoms of the piers and the bed rock, but also brought to light the presence of numerous voids of considerable size

in the concrete, an evidence of the uncertainties incident to the placing of concrete under water.

New Piers Found Necessary

Based on the results of this investigation it was decided to construct new piers on foundations carried down to the rock, the new piers being so placed as to avoid interference with the old ones, and also to afford a minimum number of span lengths for the superstructure. The results are shown in the general elevation of the old and new bridges. The new bridge will consist of three 242-ft. spans, three 192-ft. spans and a 280-ft. draw-span, together with three 90-ft. girder spans, one of which forms a part of the west approach, while the other two are incorporated in the east approach. Another drawing shows the general characteristics of the new piers.

Before proceeding with the foundation work, it was decided to explore the river bed at the site of each pier by core borings. These boring operations were carried on inside a three-inch casing which was pushed down into the river bed with the aid of a 1¼-in. jet pipe, and churned actively until the casing reached the rock bottom. In some cases boulders were encountered, making it necessary to use explosives to clear the way for the casing. Upon reaching the rock, the diamond drill operations were started, the holes being carried down to a depth of from 9 to 13 ft. for the purpose of making certain that the rock encountered did not form part of some shallow stratum overlying soft material. These cores were one inch in diameter. The boring operations were started on April 7, 1922, and completed on May 15. The results obtained in this way proved highly accurate and were confirmed by subsequent foundation operations. In a number of instances the drill hole was found when the rock surface was exposed in the caisson working chamber.

Contractor Had Full Use of Track

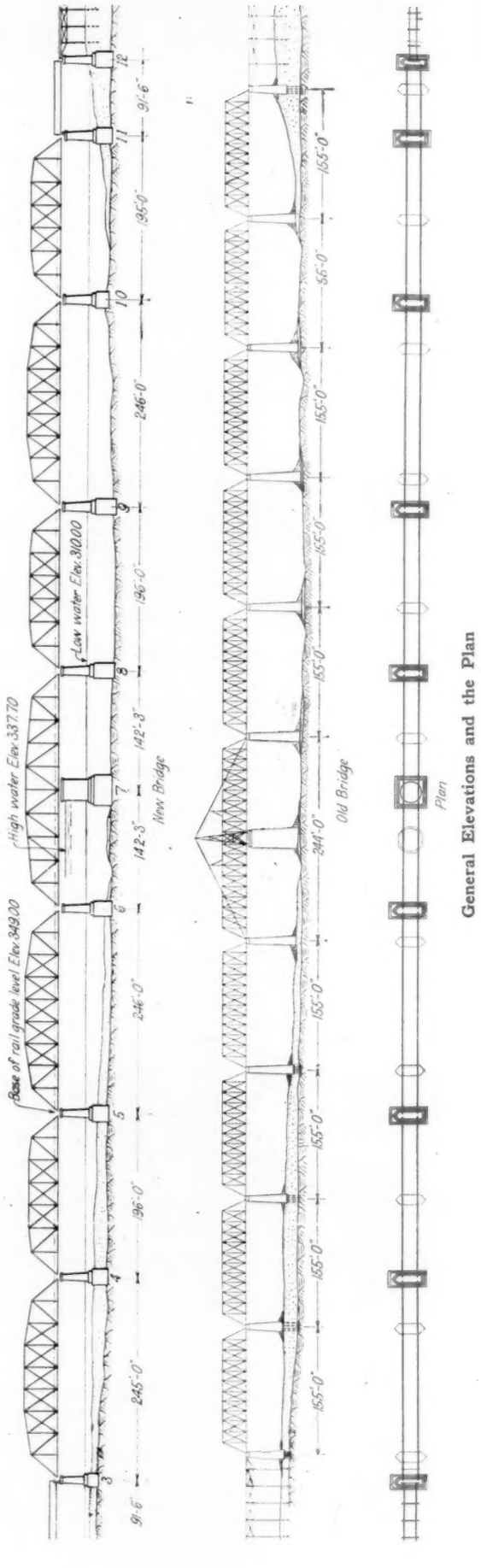
The fact that there is 35 ft. of water over the bed rock at low stage pointed to the use of the pneumatic process for this work, and a contract for pier construction to be carried out by that method was awarded to the Missouri Valley Bridge & Iron Company of Leavenworth, Kan. The contractor started the construction of the camp on July 10, and work on the first pier was started a month later. The discontinuation of traffic over the bridge gave the contractor a pronounced advantage in carrying on this work. Not only was he given undisputed use of the track over the bridge, but also that on the west approach, where a borrow pit on a level with the track afforded a convenient site for the storage of material, the construction of the concrete mixing plant and the laying out of a yard for the framing of timbers used in the caisson construction, the track being used for the hauling of timbers and concrete out on the bridge directly over the point of use.

The caissons were built in a pontoon that was moored alongside the west approach trestle, where a stiff-leg derrick, erected on bents at the level of the bridge track, was used to lower the timbers from a push car on the bridge track into the pontoon. After each caisson was completed, the pontoon was filled with water, permitting the release of a removable side and allowing the caisson to be floated out and towed into position under the bridge.

Work Not Difficult

The character of the construction in the caissons is indicated in the sketch. They were entirely of timber construction, except for a structural steel cutting edge and a reinforced concrete cover. The inside of the working chamber was painted white as an aid to illumination.

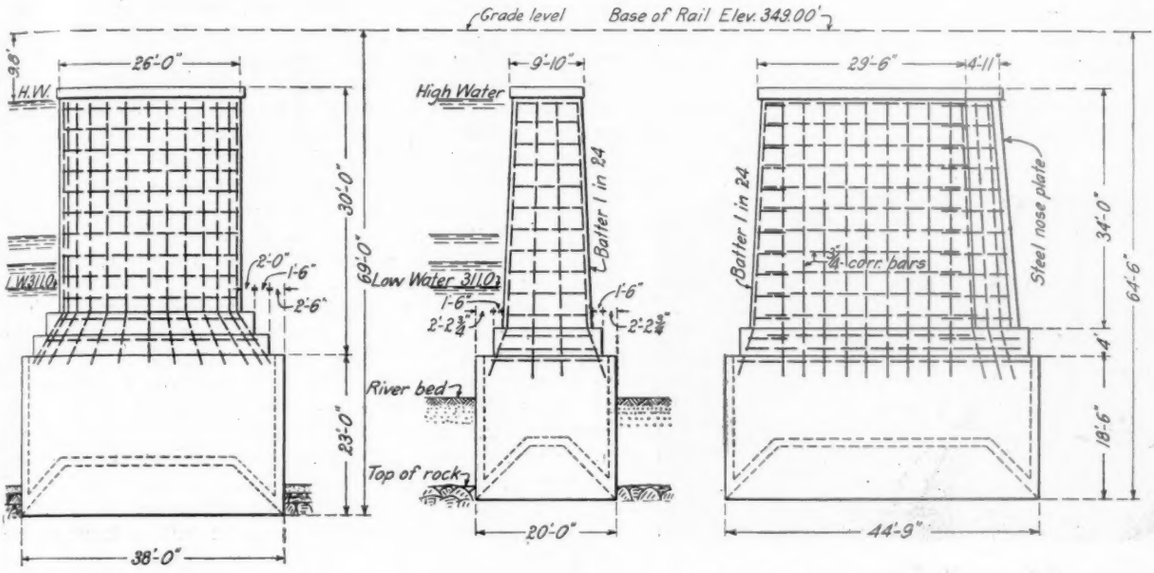
Each caisson was equipped with a man shaft and lock three ft. in diameter and a material shaft and lock two ft.

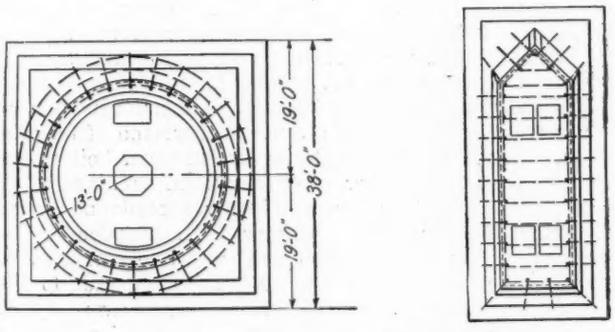


General Elevations and the Plan

in diameter. All material was hoisted through the material lock in a cylindrical bucket with the aid of a stiff-leg derrick mounted on a barge. As the pressure was relatively light, rarely exceeding 20 lb., no difficulty was encountered in working the men a full eight-hour shift, the work being carried on continuously with three shifts in 24 hours.

The concrete mixing plant was of a conventional type, consisting of a one-yard Lakewood mixer supported on a platform at a sufficient height above the track to permit spouting directly into a hopper car, with a superimposed sand and stone bin having a capacity of 15 cu. yd. of sand and 30 cu. yard. of stone and feeding into a double measuring hopper adjacent to the mixer. A special feature of this mixing plant was the facility for handling cement, which was stored in a house having a capacity of 24 cars adjoining the mixing plant. This house was equipped with a tram track extending up an incline, by means of which a small dump car handled by a hoisting cable operated from the mixing platform was used to deliver cement to the mixer. The sacks were emptied into the car on the floor of the cement house and the cement dumped directly into the measuring hopper at the mixer. The concrete was hauled out into the bridge by a bottom dump hopper car of two cu. yd. capacity.





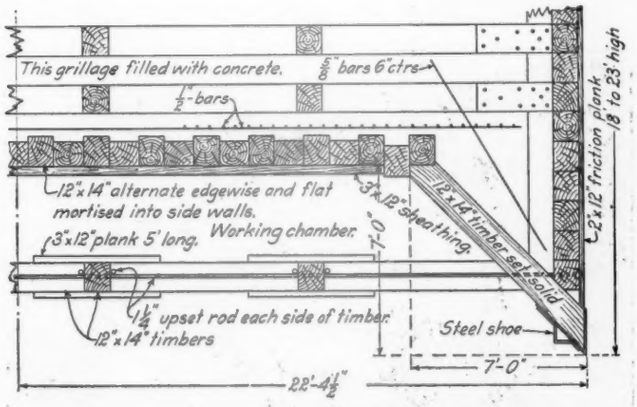
Typical Details of the Piers, Pivot Pier on the Left

Contractor Provides Excellent Plant

One noteworthy feature of the project was the unusually complete plant provided by the contractor for the conduct of the various operations. This included a power house, containing two Ingersoll-Rand two-stage air compressors, having rated capacities of 1,000 cu. ft. of free air per minute, which supplied compressed air to the caissons. They were operated by 100-hp. induction motors using 220-volt, three-phase, 60-cycle current. There was also a high pressure compressor operated by a 75-hp. motor, which supplied air for drills and other pneumatic tools. Current was purchased from a local public utility company, being delivered at 6,600 volts and stepped down to 220 volts and 110 volts by transformers at the plant. Current was also used extensively for power outside of the plant and for electric lighting, in fact, for all power operations except pneumatic tools, locomotive cranes, a dinkey engine used to operate material cars, and the stiff-leg derrick on the barge.

Special pains were taken by the contractors to supply a high grade sanitary camp. In addition to suitable bunk houses and mess halls for the white and colored laborers, individual houses were provided for the foremen and others who had their families on the ground. As an adjunct to these, a community laundry was provided, suitably equipped with electric washer, mangle and tubs.

The estimated cost of the new bridge is about $1,200,000,



Sketch Showing General Details of the Caisson

of which approximately one-half represents the cost of the substructure, which is now practically completed. The principal quantities involved were as follows: Sand and gravel excavation, 3,000 cu. yd.; rock excavation, 800 cu. yd.; cubical contents of the caisson from river bed to the

bottom of the pier shaft including both concrete and timber, 9,000 cu. yd.; concrete in the pier shafts 7,000 cu. yd. About 80,000 lb. of steel was used in the piers in the form of reinforcing and nose plates.

Good records were made in the sinking of the caissons, as indicated by the following records for piers I, II and III:

Pier I—Caisson landed at elevation 308.57 on September 12, Caisson on rock* at elevation 292.53 on October 6.

Pier II—Caisson landed at elevation 307.35 on October 7, Caisson on rock* at elevation 291.09 on October 20.

Pier III—Caisson landed at elevation 307.15 on October 20, Caisson on rock* at elevation 290.25 on November 3.

The contractor's organization included approximately 100 men. This force was divided approximately as follows: 25 carpenters on form and caisson construction, 3 calkers,

The Framing Yard

25 laborers on concrete work, 6 hoisting engineers, including one for each shift on the caissons, 14 men and one foreman for each shift in the caisson, one master mechanic, one electrician, two blacksmiths maintaining drills and two carpenters foremen.

The investigation, design and construction of this bridge has been handled by the engineering department of the Union Pacific System. H. C. Mann is engineer in charge at the bridge.

*Elevation on rock signifies elevation after cutting two feet into the bed rock.

Kadel & Herbert

Radio on a Train in England

Trust Agreement Applicable to Fixed Facilities

THE EXTENSION of the principle of the trust agreement, so successfully used for financing the purchase of railway equipment, has been worked out so that it may practicably be employed to finance the purchase of a limited class of fixed facilities. Working with a group of bankers, the National Boiler Washing Company has developed a form of contract for the sale of fixed facilities controlled by patent which is said to meet both the legal and financial requirements of sound collateral, and a $5,000,000 investment corporation has been organized to handle this class of paper. Within the scope of its operation, the new plan has removed what in many cases is a serious obstacle to the improvement of or addition to fixed railroad property, that is, the necessity for a general bond issue if the road is unable to pay cash for the improvement out of surplus.

Equipment trusts have long been used successfully as a means of financing the purchase of railway rolling stock on terms which have little relation to the general credit standing of the purchasing roads. Experience has shown them to be not only a safe but a popular form of investment. The fundamental characteristic of rolling stock which makes the trust agreement practicable is the separable character of the property involved. Title to this property remains in the hands of the trustee until the obligations of the trust agreement have been fully discharged, and in case of default on the part of the road assuming the obligation, the property may be disposed of through lease or sale with little, if any, loss to the holders of the trust certificates.

But heretofore the application of the trust agreement has been confined to rolling stock. To apply it to the acquisition of any form of fixed property has been considered impossible because of the fact that any additions to or improvements in the fixed facilities on an existing railroad immediately become a part of the general property, subject to the terms of whatever mortgages may be outstanding. The additions or improvements, therefore, are of no value as security for any obligation involved in their own purchase.

After finding the lack of a convenient method of financing to be a serious obstacle to placing its hot water boiler washing equipment and other engine terminal facilities in the terminals of railroads that admittedly needed and desired to secure this equipment, Spencer Otis, president of the National Boiler Washing Company, undertook to find some form of contract which would permit the railroads to purchase such equipment out of earnings on a term payment basis without requiring an increase in funded indebtedness, which at the same time would meet the requirements of discountable commercial paper. It finally developed that a form of contract licensing the purchasing railroad to use a piece of equipment or facility controlled by patents held by the seller, could be made to meet these requirements. By the contract, the title to the property is retained by the selling corporation until the final discharge of the contract obligation by the purchaser, the purchaser in the meantime, being licensed to use the equipment on a rental basis. The purchaser issues a series of lease notes maturing at regular intervals without interest. For terminal equipment these are spread over a sufficient period so that in effect the savings from operation are said to more than pay for the equipment. The selling corporation sells its contract and notes to the investment corporation, which holds and collects them and uses them as collateral in the issuance of its own securities, which are disposed of to the investing company.

The Roland A. Crandall Company, with a capital of $5,000,000, has been incorporated to handle this class of securities, which are now being underwritten by a number of banks.

Training and Inspiring the Supervisory Forces

Fruitful Results Obtained by Pennsylvania System with Special Lecture and Discussion Courses

By I. U. Kershner
Service Agent, Eastern Region, Pennsylvania System

LET ME REMIND YOU of the low morale that prevailed among employees, especially among foremen and minor officials, when the railroads of the United States were returned to their rightful owners in the spring of 1920. This demoralization among supervisory forces was so prevalent and so outstanding as to lead to the belief that an effort must first be made to correct the misunderstanding and improve the morale of the supervisory forces before much progress could be made in restoring efficiency and loyalty among the rank and file.

Several Plans Tried

The Pennsylvania Railroad considered a number of plans, but only two were given an actual trial during the winter of 1920 and 1921. The first was a series of twelve weekly lectures involving use of text books and a short correspondence course given by an outside educational organization, the total cost of which was about $42 per man. The second was a series of lectures and discussions given under the auspices of the Philadelphia Industrial Association at a cost of $5 per member. In order to encourage enrollment, the management offered to pay one-half the fee of those who satisfactorily completed the lecture-correspondence course and also for those who attended a majority of the lectures and discussions. As there was no request from the men for the continuation or extension of the lecture-correspondence course, nothing further was done in that direction.

However, in the course given by the Philadelphia Industrial Association in Philadelphia during the winter of 1920-21, there were enrolled a number of foremen from our shops at Harrisburg, Pa., which is located 104 miles west of Philadelphia, and at the end of the course a request came from these men asking that, if possible, a course be conducted at Harrisburg during the following season so that they might participate in the benefits given to the supervisory forces in Philadelphia without such a long journey and the consequent loss of rest. This request was complied with and, with the advice and assistance of Dr. Joseph H. Willits of the Wharton School, University of Pennsylvania, the management devised a course and started it at Harrisburg on February 1, 1922. The enrollment was 308, more than 90 per cent of whom, at the end of the course, voted in favor of having it continued in 1923.

The great success of the movement at Harrisburg led to the selection of four other points—Trenton, Wilmington, Altoona, and Renovo—at which similar courses were started in 1923, the first meeting being held on January 8, 1923. The total enrollment was 1845, the largest at any point being 581 and the smallest 95. The average attendance throughout the course was about 80 per cent and the interest was well sustained. The last meeting was held on March 22, 1923. So much for the history of these courses.

What the Courses Are For

The purpose was to improve the morale and efficiency of supervisory forces by providing a means of giving every man a keener appreciation of his part in the operation of the railroad; of broadening his knowledge concerning every phase of his own particular job; of correcting misunderstandings through a better acquaintance with the problems of management, and vice versa; of creating inspiration; of promoting co-operation between different departments or sections of the same department, and of developing closer personal relationships not only between the supervisors themselves but, also, between supervisors and their superior officers.

The qualifications for enrollment were that the employee must have attained to a rank equal to or higher than that of gang foreman. To be more specific, in the transportation department this included agents at the larger stations, assistant yard masters, assistant train masters, traveling engineers and firemen, and assistant road foremen of engines; in the maintenance of equipment department, gang foremen and general foremen; in the maintenance of way department, track, bridge, building, and other maintenance of way foremen and assistant supervisors; and in all departments, chief clerks and all higher officers of the company who might wish to enroll.

Organizing the Clubs

At each of the points notices were first sent out to all eligible employees, briefly outlining the course and inviting them to attend a preliminary meeting at which the matter would be discussed in detail. At Harrisburg, they had for a number of years what was known as the Shop Foremen's Club, which was used as a nucleus for the organization in connection with the first course given early in 1922, but at the other four points, where the course was to be given for the first time, a vote was taken which developed a favorable sentiment, after which a temporary organization was formed chiefly for the purpose of soliciting membership. This was followed by another meeting at which a permanent organization was formed, with a president, a vice-president, a secretary, and a treasurer, together with the usual committees. The first meeting was held at Trenton where they adopted the name of "The Pennsylvania Railroad Club of Trenton," and at subsequent meetings at the other points the same name was adopted except for the substitution of the name of the place at which the club was organized, so that by January 1, 1923, we had five Pennsylvania Railroad Clubs composed entirely of supervisory officers with the membership assigned to groups of not more than twenty-five, and each group in charge of a group leader or chairman and one assistant.

A general committee was formed consisting of the president of each club and a representative of the assistant general manager who acted as chairman. The representative of each club submitted a list of suggested subjects and speakers, and from these lists a uniform program was arranged for the four points where the course was to be given for the first time, the Harrisburg club being permitted to select its own program for its second year.

The course consisted of ten lectures, one each week for ten consecutive weeks. There were five speakers from colleges and industrial plants and five officers of the Pennsylvania Railroad System, including, among others, such men as General W. W. Atterbury, vice-president in charge

*Abstracted from a paper presented before the New York Railroad Club on May 18.

of operation; Elisha Lee, vice-president of the Eastern Region; C. S. Krick, general manager of the Eastern Region; and the general superintendents. In selecting the outside speakers, only recognized authorities were approached, and it was very gratifying to find the willingness with which they responded as soon as they learned the purpose of the meetings.

The general committee agreed upon a uniform fee of $5 which was collected at all points. The management offered to bear one-half the expense directly chargeable to the course and at different times assessed the local clubs for money to meet their proportion of the expense incurred. At the end of the course the total expense for each club was determined and any surplus refunded to the clubs for such disposition as they saw fit. This is perhaps the most satisfactory method of handling the expenses for speakers, as it enabled us to make all settlements promptly and later secure the approval of the clubs for all the charges against them.

There was, of course, nothing particularly new about the feature of lectures and discussions because, at least fifteen years ago, the superintendent of telegraph, for several years in succession, conducted a series of meetings for supervisors in telegraph and telephone work, at which technical papers were read and discussed to the mutual advantage of both men and management; and doubtless similar meetings have been held in other departments both before and since that time. However, in the plan adopted, the program was more varied; the membership was thrown open to all departments, men were assigned to definite groups, and discussions were conducted under circumstances which make for a more free and open expression than it has been possible to secure in large gatherings.

The Group Discussions

Each week, a half hour before the lecture, there was a meeting of the group leaders and their assistants, when questions for discussion were analyzed, certain points emphasized, and suggestions given as to the best manner of promoting discussion and arriving at definite conclusions. In this way the most important points for discussion were brought to the attention of all concerned so that there was a greater likelihood that the same points would be raised in all of the classes. These group leaders and assistants were selected with considerable care because they should be not only men of experience but should also have special ability to promote discussion and direct it along proper lines. One of the difficulties we had with some of the group leaders was to keep them from doing too much talking themselves or from permitting the discussions to become perfunctory instead of encouraging the members of the group to give a full and frank expression of their opinions. Constant supervision and considerable diplomacy are required to see that the group leaders continue working along right lines and are constantly alert in their classrooms.

Beginning between the hours of 7:00 and 7:30 p. m., depending upon the local train service, there was a lecture which lasted one hour, at the close of which each group went to a room, to which it had been previously assigned, and there spent one hour in discussing points raised in the lecture and a selected list of questions bearing upon the subject of the lecture and pertaining to actual occurrences taken from the official records, with names, dates, and locations omitted. These questions for discussion, in printed form, were distributed to the members of each group one week in advance so that each man might have an opportunity to give them some thought before being asked to express an opinion. A typical list of such questions follows:

The Value of Education in Industry

1. What responsibility has an official for knowing the local educational opportunities that will help in the training of his men? What is being done in your department to encourage employes to make some profitable use of their spare time? What additional training would probably make your employes more efficient?

2. What opportunities does the company offer for the education of its interested, ambitious employes? What additional educational opportunities do you recommend? What advice would you give to a young man expecting to go into railroad work who has just been graduated from a technical high school?

3. What are the advantages of an apprentice training program? Does the apprentice get his trade instruction from the supervisory officer or from the workmen? Is the apprentice always taught the best method of doing the job? Is the workman who knows how to do a job always able to teach another man?

4. By what means does a man become educated (trained) for his job? When is the education of an employe complete? On whom rests the responsibility for the thorough education of an employe for his particular job?

5. Does waste of time and of materials, or failure to cooperate, or inability to get along with men, or failure to follow instructions indicate lack of training (education) for the job? Explain.

6. Who gains most when an employe has been systematically and intelligently trained for greater efficiency and for increased responsibility?

7. Has the supervisory officer any alibi when his men misuse the facilities that the company has installed for their comfort? Does failure to correct such abuses reflect on the intelligent leadership of the official? Can an employe be considered well educated who wantonly disfigures or destroys valuable property?

8. Explain how misinformation and lack of education adds to the operating expenses of your department. Could the railroad profitably spend more for the education of its employes?

Considerable pains were taken to make it clear to all concerned that frank and honest opinions were desired, that no man's expression of opinion would in any way be detrimental to him, and that all constructive criticism was welcomed.

By way of illustration, at one of the group discussions a foreman started to talk about certain conditions in his department but stopped when he observed the superintendent enter the room. That officer immediately put the foreman at his ease, urged him to be specific, and later carefully explained in detail just why conditions had not been adjusted and mentioned the difficulties that higher officers sometimes encounter in securing necessary appropriations. That these men were interested was not only indicated by the spirited discussions in which they engaged, but also by the fact that on their way home they continued their discussions, particularly of the lectures, as observed by the speaker who, at one point in particular, after each meeting, rode for 30 miles in a special coach attached to the train for the accommodation of those who lived some distance away.

The division of members into discussion groups required from five to twenty classrooms at each location, and it was found that the most suitable buildings were the high schools. The local committees of the various clubs then took the matter up with their respective school authorities and had no difficulty in securing public school buildings, rent free, at each of the five points where the classes were given; the only cost being for light and janitor service. We were thus able to secure ideal quarters using the main auditorium for the lectures and assigning each group to a particular recitation room for their discussions.

The Subjects Discussed

At the five points already named, 14 subjects were discussed by 18 different speakers, seven of whom were from outside the railroad company's organization and received a fee and personal expenses. The list of these subjects and speakers is as follows:

"The Pennsylvania Railroad System"—Dr. T. W. Van Metre, Professor of Transportation, Columbia University

"Industry in Relation to the Foreman"—James B. Horn, Graduate of University of Moscow.

"The Value of Education and Training in Industry"—Dr. David Friday, President, Michigan Agricultural College, and also by Dr. Henry C. Metcalf, Director, Bureau of Personnel Administration, New York City.

"Wage Systems"—Keppele Hall, Consulting Engineer, Cleveland, Ohio.

"The Foreman and Labor Turnover"—G. M. Basford, New York City.

"Railroad Operation in Poland and Russia"—Colonel C. S. Gaskill, former Mechanical Aide, Polish State Railroads.

"The Foreman's Part in Management"—Charles Woodward, Cleveland, Ohio.

"Cooperation"—General W. W. Atterbury, Vice-President in Charge of Operation, P. R. R. System.

"The Foreman's Responsibility to His Men"—Elisha Lee, Vice-President, Eastern Region.

"Materials and Supplies and Their Relation to Production"—J. M. Henry, General Superintendent Motive Power, Eastern Region.

"Man Building"—General Superintendents C. I. Leiper, W. M. Wardrop, and H. M. Carson, also H. A. Enochs, Supt. Wage Bureau, Eastern Region.

"Planning for Results"—A. C. Davis, Supt. Motive Power, Southern Division.

"Shop Schedules and Shop Delays"—Eliot Sumner, Supt. Motive Power, New Jersey Division.

"How the Business of the Railroad Is Handled"—R. C. Morse, Jr., Supt. Philadelphia Terminal Division, formerly Supt. Freight Transportation.

The Results

The interest manifested not only by the members themselves, but also by the higher officers of the company, was very gratifying. There is a strong sentiment on the part of the members of all the clubs in favor of continuing the course next winter and requests have been made by employees from other locations asking that courses be conducted of several additional points.

The effect of these courses was rather forcibly illustrated at Harrisburg during what is called the shopmen's strike of July 1, 1922, which began only a few months after the completion of the first course given at that point. Harrisburg was formerly the headquarters of the shopmen's organizations and was well known as one of the strongholds of union labor, but when the strike of July 1, 1922, was called only a comparatively small number of our employees left their work; our operations at this point were affected less than at any other point of similar importance, and the men remaining on the job worked faithfully to keep our operation as near normal as possible. There is no doubt but that this was due largely to the loyalty of the supervisory forces and their influence with those employed under them.

Very encouraging reports have been received from various officers relative to the improved morale that has resulted; and it is the general opinion that these courses have been mutually beneficial and more than justify the time and money expended both by management and men.

Annual Convention of Master Boiler Makers

Preliminary registration at the fourteenth annual convention of the Master Boiler Makers' Association, held at the Hotel Tuller, Detroit, Mich., this week (May 22 to 25), indicated a record attendance. About 300 members of the association, 125 representatives of the Boiler Makers' Supply Men's Association and many guests were present at the opening session.

The meeting was called to order at 10.15 a. m. by Thomas Lewis, general boiler inspector of the Lehigh Valley at Sayre, Pa., and president of the association. After the invocation, J. C. McCabe, general boiler inspector of the State of Michigan, acting for the mayor of Detroit, was introduced. He reviewed briefly the promotion of safety in boiler requirements in the State of Michigan, giving credit to the builders of locomotive boilers for the part their methods have played in building better boilers and to the members of the association in properly maintaining them. The standards of construction and material used in locomotive work have aided the American Society of Mechanical Engineers materially in developing the standards of sections of the Boiler Code. The great value of the work of the association is shown in the comparatively few accidents that occur. High-class design, construction, inspection and repair make possible the degree of quality realized in locomotive work.

President Lewis, in his annual address, pointed out the annual meeting fulfilled two functions—that of giving men interested in boiler work the opportunity to meet others whose life work was the maintenance of boilers and of providing a clearing house for ideas that would be helpful to all. During the past year the master boiler makers of the country have played a more important part than ever before in keeping the motive power of the railroads in condition. The future indicates that the boiler makers will be under even a greater strain to meet requirements made upon them. Locomotive boilers must be maintained to as nearly perfect efficiency as possible if the roads are to meet increased traffic demands. It has been said that 97 per cent of the efficiency of a locomotive depends on its boiler. The present emergency will not permit the practical boiler maker foreman to be ignored and his value is being more fully realized by the mechanical department officers of the railroads every day. He concluded with the advice to the younger members of the trade present that work and education were necessary to their advancement and that full advantage be taken by them of the educational possibilities available through the papers and discussions.

A. G. Pack, chief inspector, Bureau of Locomotive Inspection of the Interstate Commerce Commission, who was to have addressed the convention, sent his regrets to the secretary as he was unable to attend. In his message to the association he expressed the belief that the work of the members would be a guide post for future boiler maintenance. Without properly repaired power, the railroads would be unable to meet the increasing demands of transportation. He stated that not only should master boiler makers and their assistants be allowed to attend these conventions of the association, but they should be compelled by their superiors to do so.

J. A. Shirley, representing A. G. Pack, read a paper on locomotive boiler failures. It showed that for nine months of the present fiscal year there was a great increase in locomotive accidents as compared with the same period last year. Many welded seam failures were among the disasters. The paper emphasized the necessity of the railroads living up to the bureau requirements.

The remainder of the opening session was occupied with the secretary's and the treasurer's reports, which indicated that the membership is about 400, with almost 200 delinquent members in addition, and that the association is on a sound financial basis.

On Wednesday committee reports were given on the following subjects: Hammer Testing of Staybolts on Our Modern Locomotive Boilers Is Now One of the Most Important Duties of Local Boiler Inspectors, J. A. Holder, chairman; Are the New Combustion Chamber Boilers as Easy to Maintain as the Straight Standard Firebox? Henry J. Raps, chairman; The Finished Material (Boiler Plates) Should Be Sound and Free from Cracks, Surface Flaws and Laminations, and No Hammer Dressing, Patching, Burning or Electric Welding Is Allowed, Charles P. Patrick, chairman; Is the Use of Automatic Stokers on Locomotive Engines Injurious to the Firebox Sheets? Do the Firebox Sheets Crack More Readily in a Stoker-fired Engine than in a Hand-fired Locomotive? H. A. Bell, chairman; What Are the Best

Methods of Detecting Defective Boiler Sheets in the Shop Before going to the Laying Out Bench and Put into Service? John J. Keogh, chairman.

The remaining sessions were devoted to committee reports, discussions, and the election of officers, as indicated in the following: What Is the Standard Method of Applying Flues in Locomotive Boilers, Also in Stationary Boilers? Albert F. Stiglmeier, chairman; The Life of the Superheater Tube and the Number of Safe-ends That Should Be Applied Before They Are Cut Down for a Smaller Boiler, J. P. Malley, chairman; To Report Topics for 1924 Convention, John F. Raps, chairman; Care of Water Tube Stationary Boilers, J. J. Davey, chairman. Addresses: Steam Leaks and the Bad Effects on the Boiler Plate, D. A. Lucas, chairman; What Experience Has Been Had in Connection with the Electric Weld Heater, John W. Hoyt, chairman; Report of Committee on Rules for Recommended Practice and Standards, Leonard C. Ruber, chairman; Reports of Committees; Election.

Special committees were appointed to handle various routine business incidental to the convention. Various forms of entertainment were provided for members and guests during their stay in Detroit by the Master Boiler Makers' Supply Men's Association.

Freight Car Loading

WASHINGTON, D. C.

FREIGHT CAR LOADING continued to increase during the week ended May 12, when the total was 974,531 cars. This was an increase of over 13,000 cars as compared with the week before, 207,000 as compared with the corresponding week of last year and 223,000 as compared with 1921. Loading of grain and grain products was 9,940 cars less than that for the corresponding week last year. Livestock loading showed a decrease of 8 cars, while there were increases amounting to 96,000 cars in coal, 6,000 cars in coke, 14,000 in forest products, 45,000 in ore, 2,875 in merchandise and nearly 52,000 in miscellaneous freight.

Meanwhile, the freight car shortage continues to decrease. For the week ended May 7 the average was 28,316, or 6,966 cars less than for the preceding period. The shortage included 9,169 box cars, and 16,672 coal cars. At the same time the number of surplus cars averaged 16,081.

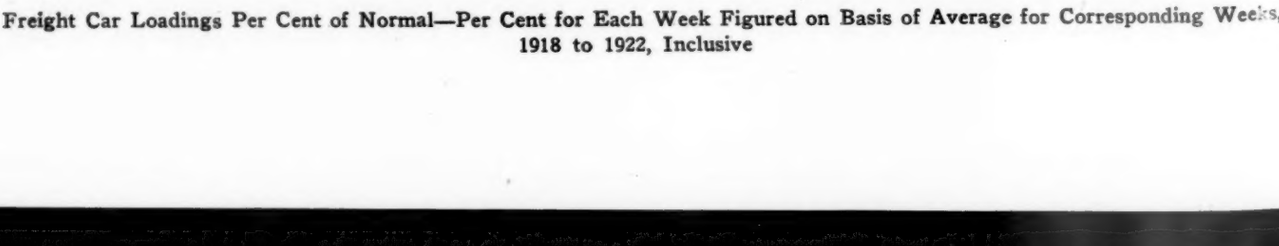
For the week ended May 14 the car shortage was further reduced to 23,761 cars, including 5,528 box cars and 15,653 coal cars. The average surplus for the period was 18,419.

REVENUE FREIGHT LOADED

SUMMARY—ALL DISTRICTS, COMPARISON OF TOTALS THIS YEAR, LAST YEAR, TWO YEARS AGO. WEEK ENDED SATURDAY, MAY 12, 1923

Districts	Year	Grain and grain products	Live stock	Coal	Coke	Forest products	Ore	Mdse. L.C.L.	Miscellaneous	Total revenue freight loaded	Corresponding period	
										1923	1922	1921
Eastern	1923	6,877	2,859	53,145	4,010	5,775	4,603	65,977	96,217	239,463	.....	.....
	1922	10,829	2,866	8,455	1,422	5,812	2,442	70,348	83,044	.....	185,218	186,256
Allegheny	1923	1,959	2,536	53,161	7,543	3,703	9,411	49,027	86,309	213,649	.....	.....
	1922	2,244	2,482	12,867	4,531	3,000	2,758	51,275	66,898	.....	146,055	153,541
Pocahontas	1923	188	82	24,930	535	1,914	504	6,456	5,203	39,812	.....	.....
	1922	192	88	28,283	318	1,457	30	6,145	4,163	.....	40,676	33,889
Southern	1923	3,129	1,851	22,163	1,443	24,809	1,712	39,551	43,274	157,932	.....	.....
	1922	2,937	2,168	21,523	999	18,975	1,064	34,005	44,334	.....	126,005	109,871
Northwestern	1923	7,957	8,156	5,418	1,204	19,070	39,852	31,894	37,874	151,425	.....	.....
	1922	10,867	7,925	2,487	1,207	17,641	5,752	30,179	32,155	.....	108,213	106,033
Central Western	1923	8,267	11,644	12,579	441	10,622	3,079	35,831	52,853	135,316	.....	.....
	1922	10,859	11,580	3,273	170	6,650	1,688	34,723	41,453	.....	110,396	103,390
Southwestern	1923	3,620	2,561	3,762	126	8,531	458	14,808	23,068	56,934	.....	.....
	1922	4,009	2,588	1,901	118	6,789	363	13,994	20,769	.....	50,531	58,206
Total West. Dists.	1923	19,844	22,361	21,759	1,771	38,223	43,389	82,533	113,795	343,675	.....	.....
	1922	25,735	22,093	7,661	1,495	31,080	7,803	78,896	94,377	.....	269,140	267,629
Total all roads	1923	31,997	29,689	175,158	15,302	74,424	59,619	243,544	344,798	974,531	.....	.....
	1922	41,937	29,697	78,789	8,765	60,324	14,097	240,669	292,816	.....	767,094	.....
	1921	34,100	25,514	161,279	5,483	49,234	24,495	216,789	234,292	.....	.....	751,186
Increase compared	1922	.....	.....	96,369	6,537	14,100	45,522	2,875	51,982	207,437	.....	.....
Decrease compared	1922	9,940	8	.....	.....	.....	.....	.....	.....	.....	.....	.....
Increase compared	1921	.....	4,175	13,879	9,819	25,190	35,124	26,755	110,506	223,345	.....	.....
Decrease compared	1921	2,103	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May 12	1923	31,997	29,689	175,158	15,302	74,424	59,619	243,544	344,798	974,531	767,094	751,186
May 5	1923	34,097	33,508	175,866	15,100	72,154	37,943	240,845	351,516	961,029	747,200	721,722
April 28	1923	36,922	31,703	180,127	15,729	77,255	24,135	241,388	356,435	936,694	751,111	721,084
April 21	1923	38,125	33,317	179,762	16,010	80,140	19,903	238,520	351,966	957,743	706,137	704,632
April 14	1923	39,329	30,319	182,356	16,014	77,313	18,296	238,636	344,496	946,759	700,155	702,116

Compiled by the Car Service Division, American Railway Association.



Freight Car Loadings Per Cent of Normal—Per Cent for Each Week Figured on Basis of Average for Corresponding Weeks, 1918 to 1922, Inclusive

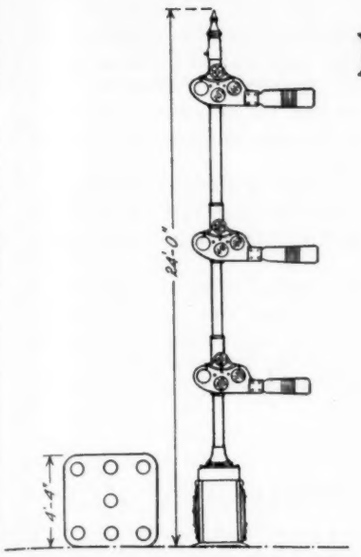


Fig. 1—Comparing the Size of the Position Light Signal with a Three-Arm Semaphore

New Signals Being Installed at the Chicago Union Station

Use of Five Position Light Indications Results in Maximum Visibility

By T. Holt

Signal Engineer, Chicago Union Station Company, Chicago

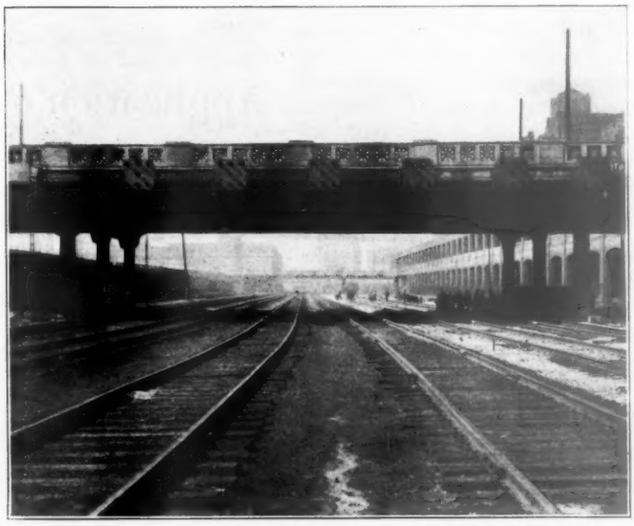


Fig. 2—The Light Signals, Supported from the Viaducts

THE elimination of movable parts in the signal and the simplification of the signal indication are features being developed in signaling at this time. Pronounced advancement has been made in the use of lights for both day and night indications, thus eliminating the semaphore arm with its motor and operating mechanism. Two types of light signals are being used. One type extends the use of the colored lights as formerly used only at night through the daylight period. This type is called the colored light signal. The other type reproduces by lights the semaphore positions, extending them through the night period. This type is called the position light signal.

Giving signal indications by lights allows a flexibility of arrangement that is impossible with the semaphore arm, because the semaphore arm must always be in evidence, while the light arrangement can be made to vanish at will. This makes it possible to reduce the size of signals materially and still give the required indications.

Advantage was taken of this in arranging the signal system for the Chicago Union Station where viaducts of a very attractive design cross the tracks approximately 800 ft. apart, the bottom of which are only 17 ft. from the top of rail, at points where signals are required.

To have used the standard semaphore signal would have necessitated signal bridges on both sides of these viaducts which would have entirely obstructed the view of these attractive structures from the tracks. Hence a signal was designed of such a size that it could be attached readily to the viaducts and not interfere with the attractiveness of their design.

The signal indications required for the proper operation of the terminal were as follows:

(1) "Stop Signal," indicating STOP, the route is not lined up.

(2) "Permissive Signal," indicating that the route is lined up but that the track immediately ahead is occupied, giving authority to proceed with caution prepared to stop short of a train or obstruction.

(3) "Slow Speed Signal," indicating a divergence over a slow speed crossover to a track which is unoccupied but on which there may be a stop signal.

(4) "Caution Signal," indicating that the immediate block is clear and the movement is being made without divergence but to approach the next signal prepared to find it at stop.

(5) "Clear Signal," indicating that the route is lined up, the movement is being made without divergence, the next signal is at caution or clear and the track is unoccupied at least to the second signal, i.e., authority to proceed at authorized speed.

The arrangement of the

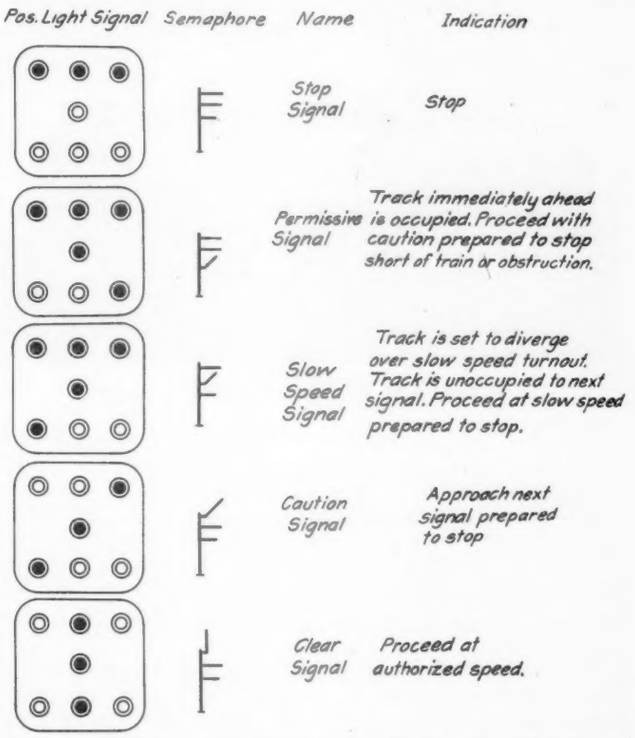

Pos. Light Signal
Semaphore
Name
Indication
Stop Signal
Stop
Permissive Signal
Track immediately ahead is occupied. Proceed with caution prepared to stop short of train or obstruction.
Slow Speed Signal
Track is set to diverge over slow speed turnout. Track is unoccupied to next signal. Proceed at slow speed prepared to stop.
Caution Signal
Approach next signal prepared to stop
Clear Signal
Proceed at authorized speed.

Fig. 3—The Five Position Light Signal Indications with Corresponding Indications of Semaphore Signal and What Each Indication Means

lights to give these indications is shown in Fig. 3, together with the corresponding indications which would have been given had semaphore signals been used.

An idea of what was accomplished in reduction in size may be gained from Fig. 1, which shows the size of the new light signal as compared with a standard three-arm semaphore signal. A photograph of one of the viaducts on which the light signals are attached shows the final results.

Southwark Scale Test Weight Car

THE ACCURACY of railroad track scales can best be assured by periodical tests and comparison with a heavy known weight. For a test weight a small compact car has been found to be the most satisfactory device and such cars are now in use on a number of large roads. To meet the demand from railroads for a reliable car of this type, the Southwark Foundry & Machine Company, Philadelphia, recently has undertaken the manufacture of scale test weight cars in two sizes, weighing 40,000 lb. and 80,000 lb. respectively.

These cars are of the same design as those adopted by the United States Bureau of Standards, Department of Commerce, and are the result of careful study and experimental investigation, followed by extended use in continued service. They are constructed entirely of metal, the frame being made of two castings machined and bolted together along the center line. They are carried on two axles with 36-in. forged steel wheels pressed on the axle. The journal boxes, which are fitted to machined pedestals, are of the roller bearing type with side thrust bearings and being entirely enclosed are thoroughly protected from dirt or from being tampered with. The

Weight Car for Testing Track Scales

friction is, of course, much lower than with the ordinary type of car bearings. Semi-elliptic springs transmit the weight to the journal boxes. The wheelbase is 7 ft.

The center running board or floor plate is of the self-draining type and acts as a hinged cover to the storage space for the calibrating weights. These consist of 50 lb. cast iron weights which are used to bring the car up to its final test weight. The covers are kept locked after the weight is once adjusted.

In the center of the body of the car and crosswise with it is a cylindrical chamber to carry the tool box or supercargo. This box contains such tools as are needed in adjusting track scales. Doors on both sides are of the hinged hatch type, closed with a screw against a lead gasket, which insures protection against water leaking into the chamber and affecting the weight. The tool box should be removed before using the car, as the tools are liable to vary some from time to time.

A. R. A. couplers, draft gear and United States standard safety appliances are provided. Standard air brake pipe and hose couplings run through the car, but only hand brakes are operative on the wheels. The air pipe is made self-draining to prevent accumulation of water.

Flag and lamp sockets are fitted to the four corners, but it is generally preferable to carry this car just ahead of the caboose, where it can be quickly detached or connected to any train.

The whole car is low with sloping sides as a protection from the influence of wind and water and is built without obstruction underneath, preventing accumulation of foreign matter. The construction meets all the requirements laid down by the American Railway Association for testing track scales.

Application of Frisco to Acquire I. G.-N. Denied

WASHINGTON, D. C.

THE INTERSTATE COMMERCE COMMISSION, by Division 4, on May 18 denied the application of the St. Louis-San Francisco for authority to acquire control of the International-Great Northern by purchase of its capital stock, as "not in the public interest." The commission named no specific reason for the refusal of authority, although it stated that in the commission's tentative plan for the consolidation of railroads the Frisco line is placed in System No. 18—Frisco-Katy-Cotton Belt, while the International-Great Northern is included in System No. 19, Chicago-Missouri Pacific. Hearings have been held in relation to the grouping of lines in these systems, but a final determination has not been made.

The Missouri Pacific has asked that if the proposed acquisition be authorized, the order be so conditioned as to provide for the maintenance of the existing through route and service and to be without prejudice to its rights in the event the tentative plan becomes ultimately effective. The report of the commission states that the state of Texas, by its attorney general, had recommended that in the event the application be granted, the order authorizing such acquisition be so conditioned as not to create a consolidation of the two companies. Communications had been received from representative organizations of business men and shippers in the interested territory and from public officials and individuals, all recommending that the application be granted.

A hearing was held on the application, at which an intervening petition was filed by the Missouri Pacific. The testimony showed that the voting trustees had declined to negotiate with the Frisco for the sale of the stock until after they had been advised by representatives of the Missouri Pacific that the latter did not desire to purchase it. The Missouri Pacific at the hearing took the position that the International was constructed to form a continuous line from St. Louis to Houston, Laredo and Gulf ports in connection with the Texas & Pacific and Missouri Pacific, that for 40 years it had been preferentially used by the Missouri Pacific between the points named and because of such long and continued use there had been created a route and channel of trade and commerce in competition with the lines of the Frisco, and the largest interchange of traffic by the International is with the Texas & Pacific in connection with the Missouri Pacific.

THE FLORIDA RAILWAY SURGEONS' ASSOCIATION held its fourth annual convention at Jacksonville, Fla., on May 14, with an attendance of about 75. Dr. H. C. Dozier of Ocala was chosen president.

Advances in Wages on Several Prominent Roads

The Principal Beneficiaries Are Shopmen, Clerks and Station Men—Pennsylvania Defends Its Course

PRESIDENT SAMUEL REA of the Pennsylvania has been subpoenaed by the Railroad Labor Board to appear before it on May 28 and explain the Pennsylvania's stand in refusing to deal with the Brotherhood of Railway and Steamship Clerks. Freight Handlers and Station Employees in a wage case docketed for hearing by the board on May 21. This order was issued by the Labor Board upon the motion of E. H. Sylvester, grand president of the brotherhood, when representatives of the Pennsylvania did not appear at the hearing on May 21.

In a letter to the Labor Board received several days before the hearing began, Mr. Rea advised the board that the Pennsylvania has no dispute with its clerical and miscellaneous forces and therefore would not be represented at the hearing called upon the request of the Brotherhood of Railway and Steamship Clerks, which, it was declared, no longer represents the clerical employees on the Pennsylvania. In this instance, the Pennsylvania conforms to the stand it took in the shopcrafts case in which the road took issue sharply with the board. In a letter to the board, Mr. Rea said:

"The clerical and miscellaneous forces on the Pennsylvania, whom the Brotherhood of Railway and Steamship Clerks claim the right to represent, adopted a plan of employee representation and elected by secret ballot the employees they desired to represent them in matters pertaining to rates of pay and working conditions. There is no dispute now pending between the elected representatives of employees and the management which, in our opinion, will not be amicably adjusted.

"We respectfully submit, therefore, that the Brotherhood of Railway and Steamship Clerks does not represent the clerical and miscellaneous forces within the contemplation of the Transportation Act, and we shall not be represented, either orally or in writing, at the meeting scheduled to be held by your board on May 21."

Although satisfactory schedules of wages and working conditions were agreed upon by the management and the elected representatives of the employees two years ago, the Labor Board, in Decision 220, ordered a new election and declared the agreements between the carrier and its employees null and void. It was in regard to the alleged violation of this decision that the current case was brought by the Brotherhood of Railway and Steamship Clerks. At the hearing on May 21, the Labor Board decided, on Mr. Sylvester's motion, to order Mr. Rea to appear before the board on May 28 to explain his letter announcing the Pennsylvania's intentions to ignore the hearing. President Rea on May 22 wired the Labor Board as follows:

"Replying your wire 21st; while the position of the Pennsylvania Railroad was clearly stated in my letter of May 18 and the reasons given why we would not be represented at hearing yesterday, I will, in response to your request and in courtesy to the Labor Board, appear before you on Monday next, 28th inst., at 2 p. m., without formal subpoena."

In this case the Pennsylvania is holding strictly to the policy which it adopted in the recent shopcrafts case, maintaining its right under the terms of the Transportation Act to establish rules and working conditions with its employees and to observe contracts established by the road with its workers. It is thought probable that Mr. Rea's appearance before the board will result in a final showdown on the road's attitude. The opinion held generally in Chicago is that there is no probability, however, that Mr. Rea will consent to treat with the national brotherhood. There are no indications, furthermore, that the Pennsylvania will withdraw from its present position of negotiating with its company organization and disregarding the decisions of the Labor Board in wage maters.

Additional Wage Increases Announced

Announcements of additional wage increases have been made during the past week. The Baltimore & Ohio granted an increase of three cents an hour to its shop employees following brief negotiations between the company and the railway employees' department of the American Federation of Labor. The increase will affect some 20,000 men and will cost the company an estimated total of approximately $1,500,000 a year. The original demand made by the federation called for an increase from the 70-cents-an-hour level fixed by the Railroad Labor Board to 80 cents an hour. The rate of 73 cents an hour which was agreed upon is viewed as a development which will stabilize the entire wage problem for shop employees throughout the country. The present demands by the shopmen on the New York Central line are for an increase from 70 cents an hour to 90 cents. It is considered likely that the fact that the Baltimore & Ohio has reached an amicable agreement with the representatives of its shopmen on a 73-cents-an-hour basis will have appreciable weight with the Labor Board in future cases which may come before it.

The wages of clerks employed by the Pittsburgh & West Virginia and the West Side Belt railroad have been restored to the levels existing prior to July 1, 1922. Clerks of two years' experience have been given an increase of three cents an hour and clerks with experience of less than two years receive an increase of four cents an hour. Inexperienced clerks have been granted a monthly salary of $60 for the first six months and $70 for the second six months.

Shopmen over the entire Pennsylvania system received a substantial increase, three cents an hour to employees in Chicago and two cents an hour elsewhere. This brings the wage rate for shopmen up to 75 and 76 cents an hour, or five and six cents above the rates prescribed by the Labor Board. The increase affects approximately 55,000 men.

The Philadelphia & Reading granted an increase to some 10,000 employees, including station workers, freight handlers and mechanics. Baggage handlers, station cleaners, gatemen, porters, janitors and station watchmen received an advance of two cents an hour; truckers, freight handlers and warehouse laborers received an increase of one cent an hour and mechanics in the bridge and building department and their helpers received an increase of from one to four cents an hour.

Section foremen, shop foremen and section and shop laborers on the Bangor & Aroostook received an advance in wage schedules amounting to two cents an hour. The wages of top ore dock workers employed by the Lake Superior & Ishpeming have been increased six cents an hour, making the present rate 57½ cents an hour, with time and a half for all time in excess of eight hours and for Sundays and holidays.

The Central Railroad of New Jersey has announced the following increases: Clerks of less than two years' experience, one cent an hour; two to ten years' experience, two cents an hour, and over ten years' experience, three cents an

hour; storekeepers and their assistants, chief clerks, foremen and sub-foremen, three cents an hour; laborers in maintenance of way department, three cents an hour; pier laborers in New York, two cents an hour; stevedores, loaders and machine men, four cents an hour; mechanics and helpers in maintenance of way department, two to four cents an hour; section foremen, $5 a month; bridge and building gang foremen, two cents an hour, and freight station laborers, two cents an hour.

Maintenance of way employees on Canadian railroads, including the Canadian Pacific, the Canadian National, the Quebec Central, the Temiskaming & Northern Ontario, the Dominion Atlantic, the Esquimalt & Nanaimo, the Fredericton & Grand Lake and the Kettle Valley, have asked for substantial wage increases. Although no intimation has been made as to the exact amount of the increases the employees desire, the general feeling, it is understood, is for a return to the schedule of 1920, with a minimum of 48½ cents an hour. The present minimum paid to track laborers is 36½ cents an hour. There is a strong feeling also for the restoration of overtime rules which would mean the return of time and a half after eight hours and for Sundays and holidays. The maintenance of way men have demanded that negotiations on the question of wages and working conditions shall begin within 60 days. Approximately 40,000 men are affected.

The Seaboard Air Line has granted an increase of three cents an hour to shop laborers, crossing watchmen, bridge tenders and pumpers. The Nashville, Chattanooga & St. Louis has increased wages of shopmen two cents an hour. Brotherhood of Maintenance of Way employees and railway shop laborers, representing 15,000 maintenance of way men on the Illinois Central and the Yazoo & Mississippi Valley, have appealed to the Labor Board for increases ranging from 10 to 13 cents an hour. Increases requested are as follows: bridge and building foremen, 10 cents an hour; assistant bridge and building foremen, fence gang foremen, hoisting engineers and bridge inspectors, except those represented by Federated Shop Crafts Committee, 15 cents an hour; ditcher engineers, 10 cents an hour; section foremen, 10 cents an hour; assistant section foremen, 11 cents an hour; mechanics in maintenance of way department, 14 cents an hour; mechanics' helpers, in same classification, 8½ cents an hour. Laborers in this department with over six months' service, 15 cents an hour; laborers with less than six months' service, 11½ cents an hour; trackmen and station cleaners, with over six months' service, 15 cents an hour; with less than six months' service, 11½ cents an hour; drawbridge tenders, hoisting foremen and pumpers, crossing watchmen and tenders, 11½ cents an hour; shop laborers, 13 cents an hour.

Twenty-five hundred maintenance of way employees on the Chicago Great Western have applied to the Board for increases in wages ranging from 8½ to 15 cents an hour.

THE ASSOCIATION OF SOUTHERN RAILWAY SURGEONS held its annual convention at Charleston on May 15 and 16, with an attendance of about 300. Dr. Edward T. Newell of Chattanooga, Tenn., was chosen president.

DAMAGES OF $50,000 against the Order of Railway Conductors and the Brotherhood of Railway Trainmen, were awarded a former conductor of the Colorado & Southern by the District court at Boulder, Colo., on May 18. Of this amount, $30,000 is actual damages and $20,000, exemplary damages. The plaintiff alleged that the unions had been instrumental in obtaining his discharge from his run on the Colorado & Southern eight years ago and had prevented him from obtaining regular employment since then. Defendants contended that the former conductor had been discharged because he was incompetent, and introduced evidence in an effort to show that he had been discharged by former employers on the same grounds.

Freight Revenue by Classes of Commodities

WASHINGTON, D. C.

THE INTERSTATE COMMERCE COMMISSION has issued an unusually interesting compilation showing information which has been much sought after for years, as to the revenue derived by railroads from the transportation of various classes of commodities, as a total and per ton and per car. The commission says the statement was prepared because of frequent requests for the information. Carriers regularly report the number of carloads and the number of tons carried, subdivided by classes, but a corresponding classification of the freight revenue has not been required, freight revenue being reported as one lump sum. A considerable number of railroads voluntarily compile such information for one or more of the 70 classes of commodities, but only about half of these compile it for every class. The practice is more common in the Western than in the eastern and southern districts. Carriers were asked to supply statements for the months of October, 1922, and January, 1923, showing as complete a subdivision of freight revenue as possible from current compilations. The number of statements received and used was as follows by districts:

	Eastern	Southern	Western	United States
Giving revenue for all classes	7	10	30	47
Giving revenue for one or more but not all classes	27	10	12	49
Total	34	20	42	96

From these statements an average revenue per ton carried was computed for each class, which average in turn was applied to the complete tonnage for the year 1922 compiled from the regular quarterly reports for 1922. The aggregate estimated revenue so derived is $3,905,541,000, as against the actual freight revenue of $4,007,014,655 shown for 1922 in the monthly reports. As the freight rates in effect in the first half of 1922 were on a higher level than they were in October, 1922, and January, 1923, a total constructive revenue smaller than the actual 1922 revenue was to be expected. In comparing the two sums it should be noted that the actual freight revenue is the net after absorptions, while no allowance is made for these in the estimated revenue by commodities. The error which may be involved is doubtless negligible for any purpose for which these figures will be used. It is not possible to give the average haul corresponding to the revenues per ton, as only a small number of the roads reporting compile ton-miles by classes of commodities. The average revenue per ton for the United States is given in two ways, one average being obtained by using as a divisor the total number of tons reported as carried, and the other being obtained by using as a divisor the number of tons originated, which excludes the duplications resulting from the fact that some tons pass over more than one railway and are reported by each as carried, except that in certain cases of re-billing such duplication can not be excluded. In the same way two figures are given for the average revenue per carload. The commission's statement gives the figures by districts also but only those for the United States are given in the table on the opposite page.

The highest revenue per ton, according to this compilation, is paid by poultry, $34.74, and the next highest in point of revenue per ton is citrus fruits, $31.20. The lowest revenue per ton is paid by logs, posts, poles and cord wood, for which the average is $0.96, while clay, gravel, sand and stone show an average of $1.03. Citrus fruits show the highest revenue per car, however, $480.34, while the average for poultry is only $382.67 per car. Logs, posts, poles and cord wood also show the lowest average per car, only $28.81. The average revenue per ton for all classes of traffic is $3.82 and the average for carload traffic is $3.67,

while l.c.l. freight averages $7.23. The average revenue per car for all carload traffic is $121.93. The class of commodities showing the highest average revenue per ton is animals and products, $9.15, but the average per car for this class is only $107.77, while products of agriculture average $158.11 per car. Bituminous coal is the single commodity paying the greatest aggregate revenue to the railroads, $679,188,000, the average revenue per ton being $2.36 and per car $120.12, while anthracite averaged $2.74 and $103.91. Anthracite and bituminous coal together contributed a revenue of $812,752,000 for 336,058,302 tons originating and 624,785,213 tons carried. This represents 20.8 per cent of the total revenues covered by the compilation and 33 per cent of the tons carried.

Commodity.	Tons originating (b)	Total tons carried (a)	Revenue (thousands)	Revenue per ton For U. S. as one system	Revenue per ton By the individual railway	Revenue per car For U. S. as one system	Revenue per car By the individual railway
PRODUCTS OF AGRICULTURE:							
Wheat	24,802,796	39,398,645	$119,499	$4.82	$3.03	$193.52	$121.75
Corn	19,275,378	34,611,636	84,511	4.38	2.44	168.28	92.56
Oats	7,646,848	15,331,804	34,633	4.53	2.26	136.21	67.82
Other grain	5,245,341	9,285,381	22,208	4.23	2.39	146.07	80.28
Flour and meal	10,695,121	24,771,469	55,660	5.20	2.25	129.78	57.04
Other mill products	9,000,627	19,711,025	39,005	4.33	1.98	93.92	43.21
Hay, straw, and alfalfa	5,722,058	10,127,230	27,782	4.86	2.74	59.99	33.89
Tobacco	884,173	1,576,288	8,014	9.06	5.08	100.60	58.71
Cotton	3,067,387	7,535,129	38,084	12.42	5.05	142.48	63.28
Cotton seed and products, except oil	3,548,119	5,346,529	11,102	3.13	2.08	70.20	46.56
Citrus fruits	1,141,154	4,833,488	35,603	31.20	7.37	480.34	115.41
Other fresh fruits	5,063,954	15,780,024	118,930	23.49	7.54	325.70	105.04
Potatoes	4,829,225	12,852,128	46,903	9.71	3.65	176.76	67.41
Other fresh vegetables	2,324,637	6,760,557	32,519	13.99	4.81	180.94	61.68
Dried fruits and vegetables	1,154,312	2,947,556	15,268	13.23	5.18	338.16	133.73
Other products of agriculture	7,381,468	10,978,230	26,252	3.56	2.39	100.81	61.35
Total	111,782,598	221,847,119	$715,973	$6.41	$3.23	$158.11	$74.87
ANIMALS AND PRODUCTS:							
Horses and mules	490,927	779,469	$4,002	$8.15	$5.13	$92.14	$58.55
Cattle and calves	9,571,435	13,496,190	60,905	6.36	4.51	73.57	52.03
Sheep and goats	1,158,854	1,884,233	11,479	9.91	6.09	97.01	61.16
Hogs	5,795,062	7,652,621	33,921	5.85	4.43	56.24	43.59
Fresh meats	2,613,781	6,054,012	37,415	14.31	6.18	184.37	77.76
Other packing-house products	2,048,956	4,429,479	24,961	12.18	5.64	194.30	91.09
Poultry	291,762	1,014,136	10,137	34.74	9.99	382.67	107.65
Eggs	565,192	1,463,195	13,839	24.49	9.46	274.25	107.30
Butter and cheese	507,384	1,324,390	11,405	22.48	8.61	278.12	108.32
Wool	359,861	934,744	6,009	16.70	6.43	194.20	78.42
Hides and leather	1,081,647	2,607,370	11,311	10.46	4.34	210.06	90.23
Other animals and products	1,750,035	3,450,090	14,729	8.42	4.27	145.77	75.42
Total	26,234,896	45,089,929	$240,113	$9.15	$5.33	$107.77	$65.15
PRODUCTS OF MINES:							
Anthracite coal	48,823,014	80,770,594	$133,564	$2.74	$1.65	$130.91	$79.28
Bituminous coal	287,235,288	544,004,619	679,188	2.36	1.25	120.12	63.17
Coke	15,437,961	24,502,214	35,356	2.29	1.44	78.85	49.32
Iron ore	52,739,885	84,602,455	70,085	1.33	0.83	68.86	45.17
Other ores and concentrates	9,677,415	14,619,101	17,670	1.83	1.21	93.01	58.74
Base bullion and matte	495,465	1,405,741	5,178	10.45	3.68	461.79	164.52
Clay, gravel, sand and stone	102,677,414	139,436,476	105,530	1.03	.76	49.42	35.74
Crude petroleum	5,935,997	11,615,287	28,724	4.84	2.47	173.77	86.28
Asphaltum	1,900,426	4,679,549	8,937	4.70	1.91	157.39	64.20
Salt	3,244,909	8,099,175	17,580	5.42	2.17	140.65	56.69
Other products of mines	4,231,169	8,668,207	14,891	3.52	1.72	147.77	70.51
Total	532,398,943	922,403,418	$1,116,703	$2.10	$1.21	$102.21	$58.83
PRODUCTS OF FORESTS:							
Logs, posts, poles, and cord wood	35,633,637	40,138,946	$34,315	$0.96	$0.85	$28.81	$25.20
Ties	3,760,299	6,357,377	12,287	3.27	1.93	94.65	56.79
Pulp wood	3,931,097	6,983,736	9,019	2.29	1.29	65.33	35.64
Lumber, timber, box shooks, staves, and headings	43,512,275	114,964,478	291,261	6.69	2.53	176.14	66.08
Other products of forests	2,233,777	4,484,330	12,198	5.46	2.72	115.15	59.10
Total	89,071,085	172,928,867	$359,080	$4.03	$2.08	$111.57	$55.71
MANUFACTURES AND MISCELLANEOUS:							
Refined petroleum and its products	30,863,324	63,155,669	$187,686	$6.08	$2.97	$169.07	$82.61
Vegetable oils	936,742	2,281,158	8,002	8.54	3.51	230.08	95.20
Sugar, sirup, glucose, and molasses	5,091,438	11,989,442	43,735	8.59	3.65	236.56	99.98
Boats and vessel supplies	112,908	217,082	1,197	10.60	5.51	150.14	92.05
Iron, pig and bloom	9,991,387	17,524,700	22,371	2.24	1.28	105.15	58.83
Rails and fastenings	2,378,627	4,706,467	8,615	3.62	1.83	149.13	75.01
Bar and sheet iron, structural iron, and iron pipe	22,168,863	45,332,983	135,255	6.10	2.98	197.92	96.64
Other metals, pig, bar, and sheet	4,328,554	9,577,562	29,355	6.78	3.07	241.11	110.17
Castings, machinery, and boilers	4,227,857	9,036,830	36,907	8.73	4.08	171.88	79.99
Cement	18,454,450	36,513,841	52,329	2.84	1.43	106.93	54.21
Brick and artificial stone	15,606,849	24,886,805	32,284	2.07	1.30	71.10	44.27
Lime and plaster	5,192,614	10,313,018	18,969	3.65	1.84	93.41	47.71
Sewer pipe and drain tile	2,090,430	3,727,588	6,752	3.23	1.81	60.03	34.05
Agricultural implements and vehicles other than automobiles	1,719,816	3,195,941	14,211	8.26	4.45	118.31	64.52
Automobiles and autotrucks	4,159,911	10,665,454	105,114	25.27	9.86	201.26	80.00
Household goods and second-hand furniture	677,900	1,245,720	6,888	10.16	5.53	100.08	55.02
Furniture (new)	691,802	1,692,286	12,579	18.18	7.43	166.11	67.59
Beverages	613,454	1,123,959	4,336	7.07	3.86	133.00	73.47
Ice	5,208,853	5,893,751	5,886	1.13	1.00	29.08	26.00
Fertilizers (all kinds)	6,817,946	10,152,733	17,772	2.61	1.75	59.08	40.20
Paper, printed matter, and books	2,774,682	7,940,317	19,355	6.98	2.44	164.73	58.37
Chemicals and explosives	7,535,197	14,911,354	41,981	5.57	2.82	165.12	81.99
Textiles	878,375	2,028,615	10,264	11.69	5.06	136.96	60.83
Canned goods (all canned food products)	3,105,822	7,021,333	30,467	9.81	4.34	226.46	102.39
Other manufactures and miscellaneous	64,817,509	121,153,290	309,241	4.77	2.55	111.24	57.21
Total	220,445,310	426,287,898	$1,161,551	$5.27	$2.72	$135.52	$68.30
Grand Total, Carload Traffic	979,932,832	1,788,557,231	$3,593,420	$3.67	$2.01	$121.93	$64.53
Merchandise—All L. C. L. freight	43,176,746	70,927,245	$312,122	$7.23	$4.40	.....	.....
Grand Total, Carload and L. C. L. Traffic	1,023,109,578	1,859,484,476	$3,905,542	$3.82	$2.10	.....	.....

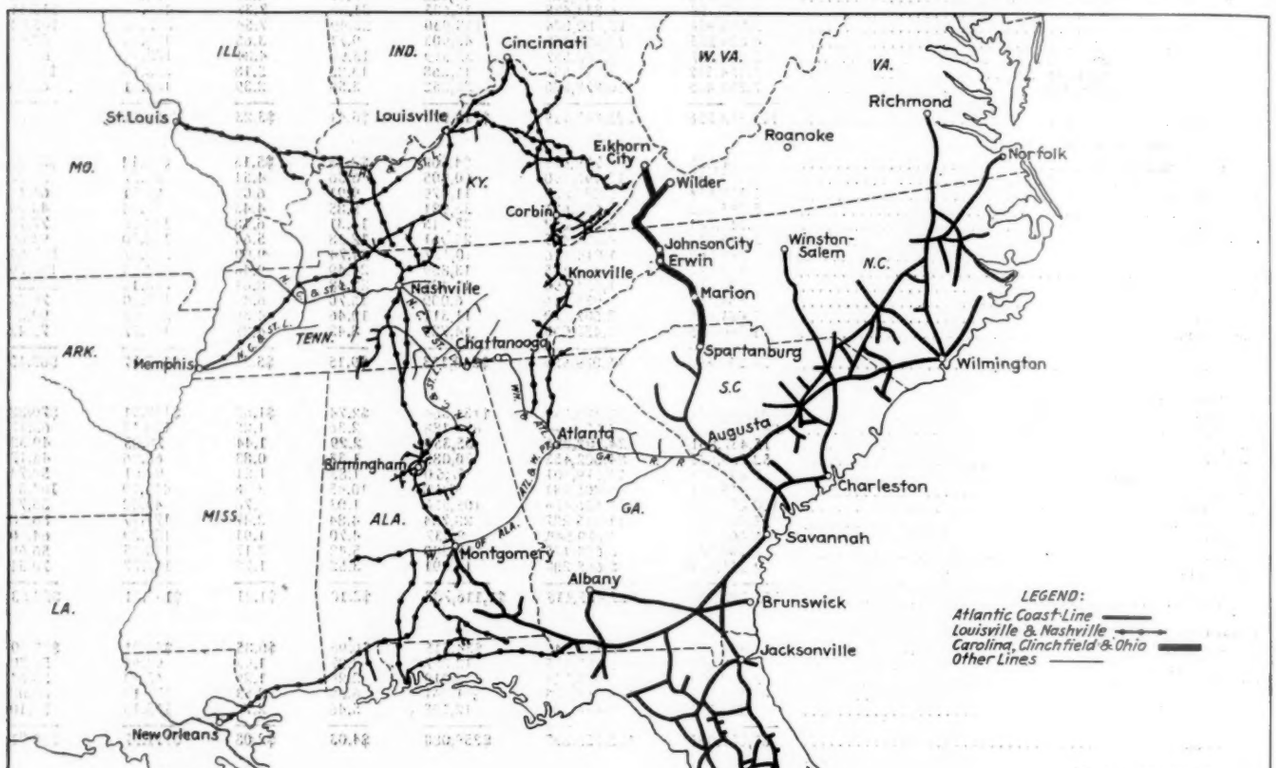
(a) Includes tonnage received from connecting carriers.
(b) The aggregate tons reported as originating, excluding duplications represented in the total tons carried, except those resulting from rebilling.

C. C. & O. Leased by L. & N.

THE Louisville & Nashville has leased the Carolina, Clinchfield & Ohio for a term of 99 years, according to announcement made in Louisville on May 17. The announcement was brief and did not include any of the reasons that the Louisville & Nashville or its parent company, the Atlantic Coast Line, which controls 51 per cent of its stock, may have had in mind in acquiring the Clinchfield property. It is to be presumed that one of the reasons is the desire of the Coast Line to secure a better source of coal for fuel purposes and for use in its territory generally. There is a general impression, also, that the Clinchfield may be used as a bridge line between the Louisville & Nashville and the Atlantic Coast Line. At present there is no physical connection by this route but a railroad is projected from the end of the Louisville & Nashville's line at Norton, Va., through the mountains to a point south of St. Paul on the C. C. & O. If this connecting link were built, it would give the Clinchfield considerable coal traffic to the southeast from the Louisville & Nashville mines in the Hazard and Harlan fields, in addition to which it would offer a new outlet for the miscellaneous tonnage of the Coast Line to the central west.

The acquisition of the Clinchfield by the L. & N. is in accordance with the Interstate Commerce Commission's tentative plan for railroad consolidations. The Atlantic Coast Line and the several properties in which it has an interest are included in System No. 11, which also includes the Clinchfield with a group of other railroads. The commission also suggested tentatively the inclusion of the Clinchfield in System No. 12, built around the Illinois Central and the Seaboard Air Line. It was Professor Ripley's suggestion which, however, the commission did not follow, that the Clinchfield should be included with the Southern Railway which, in recent years, has had very close traffic relationships with the Clinchfield and which has taken approximately 75 per cent of the coal from the Clinchfield territory, particularly via the outlet from the southern end of the Clinchfield at Spartanburg, S. C., and thence to tidewater at Charleston.

The Clinchfield operates a total of 291 miles of line. It extends from Elkhorn City, Ky., across a mountainous territory of southwestern Virginia, northeastern Tennessee and western North Carolina. At Elkhorn City it has a connection with the Chesapeake & Ohio, but the major part of its tonnage movement is towards the south. The Clinchfield was built by the Blair interests as an outlet for extensive coal properties in the Clinchfield district. The Carolina, Clinchfield & Ohio is comparable in many ways to the Virginian Railway. It was built with high standards of construction with a favorable grade line in spite of the mountainous territory traversed and, like the Virginian, its operations are characterized by heavy train loading and low unit costs. About 70 per cent of the road's total traffic is coal. The Carolina, Clinchfield & Ohio was benefited in 1922 because it served non-union coal mines and during the cessation of operations in the union coal districts it supplied a considerable volume of tonnage through its northern outlet. Its total operating revenues for the year totaled $7,608,602 and its net operating income was $2,864,428, which compared with $2,492,298 in 1921. The property had a standard return for operations during federal control of $1,627,963. The fact that the 1922 net operating income fell far from being double that amount, indicates the expansion which has been taking place in the Clinchfield's business.



The Atlantic Coast Line and Its Controlled Properties

Hearings on I. C. C. Consolidation Plan

Testimony Ranges from General Approval of Plan with Modifications to Suggestions for Repeal of Law

WASHINGTON, D. C.

A GREAT VARIETY of views as to the grouping of eastern roads in the Interstate Commerce Commission consolidation plan, as well as regarding the practicability or desirability of consolidations in general was expressed by railroad officers at the hearings before Commissioner Hall which began on May 16 on the eastern systems of the commission's tentative plan. The testimony of A. H. Smith and Samuel Rea regarding proposed systems Nos. 1 and 2, given on May 16, was reported in last week's issue. This was followed by testimony on Systems 3, 4, 5, 6 and 7a up to May 19. An adjournment was then taken until May 24, when consideration of Systems 7, 8 and 9 was to be taken up.

System No. 3—Baltimore & Ohio

Daniel Willard, president of the Baltimore & Ohio, was the first witness on System No. 3 of the tentative plan, which includes, in addition to the Baltimore & Ohio, Sandy Valley & Elkhorn and Staten Island Rapid Transit, the Reading System, comprising the Philadelphia & Reading, Central of New Jersey and various others, also the Cincinnati, Indianapolis & Western; Chicago, Indianapolis & Louisville; New York, New Haven & Hartford and Central New England; the Lehigh & New England and the Lehigh & Hudson.

Mr. Willard expressed general accord with the tentative plan and a desire to co-operate with the commission in carrying out the provisions of the act, but he said the Baltimore & Ohio had no plans of its own looking to consolidations such as have been outlined. He also expressed the opinion that the New Haven should not be included in this system, but that the New England lines should be put into a regional group. In a supplemental statement he also opposed the suggestion made by A. H. Smith that the Central of New Jersey ought to go to the New York Central. He also said that it would seem wise for the commission not to attempt to go too far toward finality in making up its plan as to go much beyond fundamentals at this time might retard progress in the end.

After outlining the history and development of the Baltimore & Ohio and submitting the statistics desired by the commission, Mr. Willard said in part:

> The B. & O. management has had no ambition to extend its mileage, nor has the company formulated any definite plans for the extension or enlargement of the system, and is only brought to consider this general question at this time in view of the provisions of the transportation act. While many different combinations might be proposed, having in mind the provisions of the act, and the various needs and requirements to be met through consolidations, in my judgment the suggestions of Professor Ripley and the tentative plan of the commission (and I refer particularly to the proposals respecting the Eastern region in which the B. & O. lines are located) constitute a logical and effective basis of procedure and if and when concluded should contribute to the efficient and economic handling of the traffic of the country.
>
> Assuming the general proposal with respect to consolidations in the trunk line territory to be carried out substantially as outlined, and assuming also that the proper and economic basis for adjustments of capital investment could be mutually agreed upon between the several ownerships, the B. & O. concurs in and approves generally (with the exceptions noted) of the proposed System No. 3.
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> We are of the opinion that the New Haven should not be included in the B. & O.-Reading System, but that the properties of that company in conjunction with all other New England railroad properties east of the Hudson river should be consolidated into what might be termed a New England regional group to be held and operated as a distinct unit interchanging traffic freely and without prejudice with the several Trunk Line systems and with the Canadian railroads.
>
> It is our further view that the same general regional plan might well be adopted to form a Michigan Peninsula regional group, the lines included in such group to interchange without prejudice with the several trunk lines as outlined in the commission's report. In the event of any substantially different treatment of these two important industrial areas, the B. & O. might desire, perhaps, to make some further and different proposals.
>
> General approval of the tentative plan is also contingent upon the adoption of the proposal for the so-called Chesapeake region (lake-to-tide soft coal carriers) comprising three groups dominated by the Chespeake & Ohio, Norfolk & Western, and Virginian railways. Any different handling of these properties than that outlined in the tentative plan, which might have the effect of enlarging or changing the relationship of other Trunk Line systems as proposed, might so affect the B. & O. System as to cause us to take some different view and desire some further adjustment in the B. & O.-Reading System, the necessity for which is not apparent under present proposals.
>
> Should a combination of roads such as proposed in the B. & O.-Reading System be effected, it would constitute a well-balanced system from a physical standpoint, and the addition of certain of the weaker lines from the standpoint of income would be measurably off-set by the inclusion of the Reading-Central Railroad properties, and so bring the whole into a self-sufficient system and one which would compare favorably with the other important Trunk Line systems, with which this system must compete under the same general rate structure.
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> The B. & O.-Reading System as outlined, while comprising 8,253 miles of line, is not so large from the standpoint of mileage as some of the already existing trunk line systems, and is so compact as to admit of the maintenance of relations sufficiently close to enable the management to divine the needs and to respond to the requirements of the territory it would serve. The traffic now developed and in prospect on these particular railroads so overlaps that it is evident with closer co-ordination of operations greater expedition and economy in its handling might reasonably be expected.
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> Attention is also called to the importance of the connection via the Reading and Central railroads to and into New York. Following the agreements entered into with the Philadelphia & Reading and the Central Railroad of New Jersey in 1886, and since continued, there has been a constant development of traffic via this route. The B. & O. has invested more than $12,000,000 in its own terminals on Staten Island and in the city of New York which may be reached only through the medium of these intervening lines. Now that the disposition of the coal properties owned by the Central Railroad of New Jersey and Reading companies has been practically accomplished, the ownership of which had caused an order of the United States Supreme Court for the severance of the relationship between the two railroads, and assuming the Reading Company to carry out its present purpose, as the court has been advised, to relinquish all its special charter rights and privileges so that it becomes simply a corporation entitled to do a railroad business under the laws of Pennsylvania, there would seem now to be no reason why the Reading Company should not be permitted to continue its ownership in the Central Railroad of New Jersey and to effect even closer relations. It would seem by so doing these properties could be operated more efficiently and economically, and with greater service to the public.
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> We are not unmindful of the general character of the Reading and Central Railroad properties as offering important terminal facilities which have led to a large interchange of traffic with several systems, notably the Pennsylvania, New York Central, Lehigh Valley, etc.
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> While perhaps the most important single connection of the Reading and Central Railroad in the volume of interchange of traffic is the B. & O., it is a fact, as pointed out by the commission, that owing to the industrial character of the sections served by these lines there is a substantial interchange of business largely local to points on the Reading and Central Railroad, with lines other than the B. & O. The continuation of such general interchange with other carriers would, of course, be fully protected by the provisions of the existing laws, and it would be to the interest of the B. & O.-Reading System, if such system were formed, not only to continue such interchange of traffic via all the customary gateways but to encourage and develop it to the fullest extent.
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> *Chicago, Indianapolis & Louisville, and Cincinnati, Indianapolis & Western.*—These lines are considered jointly as possible additions to the B. & O.-Reading System, for the reason that the one

without the other might constitute an element of weakness to the proposed system, whereas in combination they afford effective connections with several important centers, notably Chicago, Indianapolis, Cincinnati and Louisville. Joint through passenger train service has long been in effect between Chicago and Cincinnati, via Indianapolis. Through freight service between the same points—70 miles shorter than the B. & O. route via Deshler—under one instead of three operating administrations could no doubt be improved and expanded with greater service to the public and benefit to the consolidated system. With possible extensions, or through trackage over existing lines in Indiana and Illinois as suggested in the commission's report, connections may be effected whereby interchange of traffic with certain of the western lines may be carried out in the mutual interest. The inclusion of these lines would seem to be both logical and helpful in rounding out a system such as proposed in the tentative plan No. 3.

Buffalo, Rochester and Pittsburgh.—The extensive use by the B., R. & P. of the B. & O. lines and the relations existing between these companies prompts the suggestion that in the furthering of the objects and purposes of the transportation act consideration be given to the inclusion of that property in the B. & O.-Reading System. In addition to the business originated directly by the B., R. & P. on B. & O. lines and terminals, there is an extensive interchanging of general traffic between these roads, which could no doubt be enlarged in the mutual interest. These lines in cooperation afford another outlet from the lakes to tide, particularly for grain, and the B. & O. lines as constructed and projected in Washington and Greene Counties, Pennsylvania, offer a large potential tonnage of Pittsburgh coal to the B., R. & P. territory.

Baltimore & Ohio Chicago Terminal Railroad.—The B. & O. Chicago Terminal, some 56 miles of line in the City of Chicago, is owned exclusively by the B. & O. The terminal company reaches and serves a large industrial section of Chicago and also furnishes terminals to several other companies operating into that city. Primarily the property constitutes a continuation of the B. & O. into Chicago, and on which this company's freight and passenger terminals are located, and might well be incorporated through consolidating directly into the present B. & O. system. However, should a more complete study of the Chicago situation indicate the advisability of a single unified terminal, in which all of the Chicago terminals lines would be incorporated, to be owned by the several lines and operated in the joint interest, with uniform basis of interchange, the B. & O. would undoubtedly join the other Chicago lines in an effort to bring about such a consolidation.

I understand that it is the purpose of these consolidations to not only retain competition but to strengthen and develop it where possible, and also to bring about a number of well rounded out, well established systems which may be operated in a successful manner, it being recognized that as things are today, some of the roads are fortunately strong financially and physically and in all ways that make for success, and that others are not so fortunate in some ways.

It seems to me that to do as Mr. Smith has suggested with reference to the Central would be contrary to the very spirit of the act, because it would seem to tend in the direction of making the strong even stronger and the weak even weaker. If you will look at the map which the New York Central has filed, you will see first of all its very strong position, coming down into Manhattan Island with its lines reaching well down to the end of Manhattan Island itself, and with its lines on both sides of the Hudson river as far south as the Central Railroad of New Jersey. In fact, Mr. Smith said himself that they were very extensively located on the west side of the Hudson river. But even a more suggestive thing I think is this: In the little insert map which you will see under the caption "New York and its Vicinity" you will find that they have left off all reference whatever to the B. & O. I had supposed that we were at least in the vicinity of New York, but apparently from the New York Central standpoint we are not even in the vicinity. I can well understand their present point of view. The B. & O. has its terminals on Staten Island, which is omitted from the insert map, as being outside and beyond the vicinity of New York City. It is from that point that we are obliged by transfer to take our merchandise and other business to Manhattan Island, Brooklyn, and other stations which we serve, a very considerable handicap as you will understand. While the New York Central is in a position to load its cars, make up its trains on Manhattan Island and start immediately for its destination, the B. & O. has a long ferry service through the most congested portion of New York Bay.

Mr. Willard added that the B. & O. would be glad to share some of the great responsibilty Mr. Smith had talked about in serving New York City and that to take from the proposed B. & O.-Reading system the rails of the Central of New Jersey would deprive it of some of the business it now enjoys while adding to the facilities of the New York Central. If the commission should seriously consider Mr. Smith's suggestion, he said, the B. & O. would like to submit a further statement on the subject. Regarding the Western Maryland, Mr. Willard said he did not consider it any menace to the B. & O., although a strong competitor. It is not in any sense a necessity to the B. & O., but economically the soundest solution of the problem would be to connect it with the B. & O. and use it as a third track as was done during federal control. There has been a strong feeling in Baltimore against any consolidation of the two roads, but if they were put together, Mr. Willard said, transportation facilities into and out of Baltimore could be improved at less cost.

Questioned by Professor Ripley regarding the idea of forming trans-continental systems, Mr. Willard said he had not given the question much thought but his impression was against it. He had never thought a trans-continental line in this country similar to that of the Canadian Pacific would be advisable. If it were a good thing it probably would have happened before this.

President Dice, Philadelphia & Reading

Agnew T. Dice, president of the Philadelphia & Reading, expressed an appreciation of the sincerity of purpose and high ability which Professor Ripley has brought to bear on the problem, but, because of the vital importance to the shipping public of keeping the Reading-Jersey Central terminals open to all connections, he hoped that the professor and the commission would ultimately give their approval to a consolidation of the Reading, Central of New Jersey, Lehigh & New England and Lehigh & Hudson River. There is an obvious lack of common interests and characteristics, Mr. Dice said, between the Reading and Jersey Central, on the one hand, and the New Haven, Central New England and western lines on the other, and he wished to make clear his firm conviction that a consolidation of those lines would involve serious and unnecessary disadvantages to the shipping public, would materially limit present wholesome competition and would seriously disturb and disrupt existing routes and channels of trade. Mr. Dice also said in part:

The report of Professor Ripley indicates that there was grave doubt whether the Reading and Jersey Central should be incorporated with the B. & O. or should be consolidated into a terminal system which would continue the open door policy by which their lines and important terminals at Philadelphia, New York and interior points have always been kept open for all their connections.

The commission appears to have been influenced in its conclusion in favor of consolidation with the B. & O. chiefly by the purpose to secure to the B. & O. access to its terminals at New York over its own rails. It may be pointed out that the B. & O. now has trackage rights over the Reading, Lehigh Valley and Pennsylvania with respect to its passenger service to the Pennsylvania terminal at New York and that there are operating arrangements with the Reading and Jersey Central for joint through freight service between Philadelphia and New York, which we believe meet fully and fairly the requirements of the B. &. O. in reaching its New York freight terminals.

It is inconceivable that the Reading and Jersey Central would ever refuse to make such arrangements as will enable the B. & O. to reach its New York terminals on just, fair and reasonable terms. If, however, such a situation should arise, the commission would have no difficulty in correcting it.

The commission has also recognized the importance to the New York Central and the public of keeping open the through route through the Williamsport (Newberry Junction) gateway via Haucks and Allentown to Bound Brook and Jersey City. It is of equal importance to the N. Y. C. to maintain the through route via this gateway to Philadelphia and other Reading territory. As the Reading and Jersey Central are interested equally with the N. Y. C. in the maintenance of these routes, there can be no more effective way to safeguard the interests of the N. Y. C. than to authorize the consolidation of the Reading and Jersey Central.

Having in mind the advantages to all the connections of the Reading and Jersey Central and to the shipping public which they and their connections serve, from the traditional policy of these terminal roads in keeping their terminals open to all connections, it may here be pointed out that the most logical and effective way to secure both the rights and interests of the B. & O. and N. Y. C. in the Reading and

Jersey Central properties is to continue and perpetuate the existing situation under which the interests of these two trunk lines and the interests of all the other connections of the Reading & Jersey Central are adequately safeguarded.

The commission appears to have been influenced to some extent in its conclusion in favor of consolidation of the Reading and Jersey Central with the B. & O. by the fact that that line and the N. Y. C. each owns 21.66 per cent of the Reading stock. The report of the commission seemingly approves Professor Ripley's view that "this intercorporate relationhip, it is believed, is not in the public interest in the long run. It savors too much of a deadlock." In answer to this opinion, it may be pointed out that the public service rendered by the Reading and Jersey Central has, in no wise, been impaired or adversely affected by the balanced stock interests of the B. & O. and N. Y. C. If stock ownership by trunk lines in terminal lines, whose terminals are of vital importance to the trunk lines, is not in the public interest, the commission will doubtless be able to find ways and means to deal with this situation. It seems evident, however, that the simplest and most effective way to secure the public interest with respect to the Reading and Jersey Central properties is to recognize their natural unity, and, by authorizing them to consolidate, to perpetuate the use of their terminals by all their connections and to maintain all the routes and channels of trade and commerce of which their lines form a part.

I confidently believe that all the advantages which the commission aims to secure through the proposed consolidation of the Reading and Jersey Central with the B. & O., with adequate protection for the New York Central traffic moving through the Williamsport (Newberry Junction) gateway, Haucks and Allentown to Bound Brook and Jersey City, will be secured by authorizing the consolidation of the Reading and Jersey Central Railroads.

The vital necessity of keeping the Jersey Central terminals from falling into hostile hands led to the purchase in 1901 by the Reading of the majority stock of the C. R. R. of N. J. Then, as a result of the decree of the district court in the Reading trust case, the majority stock of the C. R. R. of N. J. owned by Reading Company was placed in the hands of trustees appointed by order of the court, pending final disposition of the stock consonant with the action of the commission in the grouping of railroads under the Transportation Act of 1920. If, as a result of this hearing, the commission concludes that it is in the public interest to authorize the consolidation of the Reading and Jersey Central railroads, an order to that effect will presumably lead to the prompt modification of the foregoing decree so far as it relates to Reading Company's stock interest in the C. R. R. of N. J. and the return of this stock to the owner with all power normally incident to ownership. Such action would automatically effect the consolidation of the Reading and Jersey Central railroads within the provisions of the Transportation Act.

Mr. Dice opposed Mr. Smith's proposal that the N. Y. C. take the C. R. R. of N. J. and some of the Reading lines, on the ground that this would cut out of the Reading system a number of important junction points and serious impair the value and capacity for public service of the remainder of the Reading system. It is quite necessary for the Reading to have adequate terminals at New York, he said, and the acquisition by the N. Y. C. of the Jersey City terminals of the C. R. R. of N. J. would give it such control of the New York terminals as would hurt the Reading and not be in the public interest. The Reading and Jersey Central, he said, could not be separated without serious detriment to both properties.

President Besler—C. R .R. of N. J.

W. G. Besler, president of the Central of New Jersey, said that the peculiar characteristics of this road as a terminal would, in his opinion, make it more desirable that it be kept as an independent neutral terminal property serving all trunk lines entering its territory on an equal basis. If merged with other roads, some of its competitive traffic might be lost, he said, and the neutral position of the road in its relations with all the connecting trunk lines has been its tower of strength. The Reading and the Jersey Central have always been complementary to each other and each had adopted the policy of keeping its terminals open to all connections. In times of congestion this has been a great advantage to shippers, because if one route were closed other routes by other connections were usually available.

Frank Burton, secretary and general counsel of the Fonda, Johnstown & Gloversville, said that its only connection is with the N. Y. C. and in any consolidation plan it should be allocated to that system.

System No. 4—Erie

This system, in the tentative plan, would include the Erie; Chicago & Erie; New York, Susquehanna & Western; Delaware & Hudson; Delaware, Lackawanna & Western; Ulster & Delaware; Bessemer & Lake Erie; Buffalo & Susquehanna; Pittsburgh & Shawmut; Pittsburgh, Shawmut & Northern; Lorain, Ashland & Southern, and Wabash lines east of the Missouri river. Professor Ripley recommended including the Lehigh Valley in this system but the commission substituted the Lackawanna and placed the Lehigh in No. 5.

F. D. Underwood, president of the Erie, said the Erie was not in any way opposed to the merging of railroads. He thought that consolidation would be of value through a lessening of the cost of operation. He suggested a consolidation of the Erie, Delaware & Hudson south of its connection with the Boston & Maine, the Monticello line of the New York, Ontario & Western, Pittsburgh & Shawmut, Buffalo & Susquehanna, Bessemer & Lake Erie, Buffalo, Rochester & Pittsburgh, Western Maryland, Toledo & Ohio Central, Wheeling & Lake Erie and the Wabash east of the Mississippi. He said he preferred not to comment on his suggestions for an alternative system at this time. His idea was that he should be permitted to testify later.

W. H. Williams, chairman of the Wabash, opposed the dismemberment of that property and said that consolidation of the railroads would be a step toward and not a step away from government ownership. He said that the consolidation of railroads would afford better opportunity for governmental and political exploitation of the railroads; cause a net loss to security holders by the unsettlement of the question of value of securities, and probably result in deterioration of service through the creation of big units. Alternatively he suggested consolidation of the Wabash, the Delaware, Lackawanna & Western, Wheeling & Lake Erie and affiliated lines, Buffalo, Rochester & Pittsburgh, Delaware & Hudson, Bessemer & Lake Erie, Western Maryland and Boston & Maine, or as an alternative for the last road, an arrangement with some other line. Generally, he opposed consolidation as of no benefit to the weaker lines.

W. S. Jenney—D., L. & W.

W. S. Jenney, vice-president and general counsel of the D., L. & W., objected to the alternative proposal to consolidate that road with the New England lines in System 7-a and also said that if the N. Y. C. and Pennsylvania systems are to be left intact there are slim chances of proposed lines 4 and 5 competing successfully with them, and no possibility thereof if the Reading and Central of New Jersey lines are to be consolidated with the B. & O. However, if such systems are to be constructed, the Lackawanna prefers its assignment to System No. 4 as proposed by the commission, rather than to System 5, as was suggested by Professor Ripley, provided satisfactory financial readjustments fair to all the participating companies can be brought about.

Mr. Jenney also said in part:

The financial strength of the Lackawanna is due to its past earning power and large surplus. While it has but a nominal bonded indebtedness on its own lines in Pennsylvania, very considerable bonds are outstanding on some of its leased properties, including the Morris & Essex in New Jersey, the New York, Lackawanna & Western in New York, and on its ferry properties. Its property investment account per mile of road is $263,401, whereas its capitalization per mile of road is $226,894.

The company owns, and has in its treasury capable of distribution, surplus assets consisting of stocks and bonds,

amounting to the sum of $121,032,667, of which $48,160,960 is the total of bonds and stocks of its subsidiary lines which it has acquired. So long as these securities remain in its treasury they are not an interest charge against the property. In the event of the taking over of the railway lines of the company by a consolidated company, these treasury assets would, of course, be distributed to the stockholders. It is apparent, therefore, that unless upon such consolidation the past earning power of the Lackawanna could be preserved and largely increased, its properties would not be helpful in carrying the load of weaker lines. Its capitalization per mile of road is comparable to the capitalization of its competitors.

The earning power of the company from transportation as distinguished from its earnings from the sale of anthracite coal, has in the past been due not only to its efficient management, but to the fact that it has been able to obtain its fair share of traffic to and from C. F. A. territory from lines now proposed to be consolidated in competing systems. While it is true that many such lines have been controlled by competitors in the past, nevertheless the same have not been merged in the parent line. Prior to the consolidation of the Lake Shore with the N. Y. C., very considerable traffic was interchanged between the Lake Shore and the Lackawanna at Buffalo. Since such consolidation very little traffic is interchanged except to local points on the Lackawanna system which cannot be reached by N. Y. C. lines. The same is true, to a far lesser extent, with respect to interchange between the Lackawanna and the Michigan Central, although the stock of the Michigan Central is almost exclusively owned by the N. Y. C. There is still some considerable interchange of business between these companies to competitive points. If the Michigan Central be consolidated with the N. Y. C., such business will be lost, as was the business of the Lake Shore. Some 40 per cent of the Lackawanna's C. F. A. interchange business has been with the Nickel Plate. In the event of the consolidation of the Nickel Plate with the Lehigh Valley, as is proposed, most of this business would be lost. The same is true with respect to interchange with other C. F. A. lines, both directly and indirectly. While it is true that additional advantage would come to the Lackawanna through the western connection with which it may be consolidated, it is believed that the net result will be a material reduction in the Lackawanna's interchange at Buffalo, as compared with what it has been able to secure as an independent line. It is therefore felt that the earning power of the Lackawanna would not only not be increased as a result of consolidation, but that such earning power would be of less value in a consolidated line than in the past. If this be true, the Lackawanna's present financial strength would be an asset of little value to the lines with which it may be consolidated. On the other hand, the result of such consolidation would necessarily be to suspend for years, if not for all time, the continued development of the Lackawanna property as is now contemplated.

This entire question is of such magnitude and depends to so great an extent upon future financial results of the operations of these properties that it would seem that the commission should at least withhold final action upon this matter until it has completed the physical valuation of these properties.

There are two reasons why it would seem advisable in the public interest, if the commission finally determines to propose the construction of consolidated Systems 4 and 5, that the Lackawanna should be consolidated in System 4 with the Erie and Wabash.

The Lackawanna has limited Jersey waterfront, practically all of which is now improved. In times of large traffic its terminal facilities have already been taxed to the utmost. They are not capable of expansion to an extent sufficient to accommodate more than the growing business of the Lackawanna itself, and would be wholly inadequate for a trunk line expected to handle a tonnage comparable with those of the other systems. For these reasons it should be consolidated with another carrier having additional waterfront on the Hudson river and additional facilities there. This would be provided by consolidation with the Erie.

The second reason is that the Lackawanna and Erie are largely parallel lines from Jersey City to and beyond Elmira, New York, with duplicate yards, freight houses and stations at many points. Throughout a large portion of this distance the roads could be operated together, with innumerable savings from an operating standpoint. This not only in the movement of traffic over the respective lines of the two companies under most favorable conditions of curves and grades, but also in the joint use of yards, freight houses, etc. It is believed that very considerable operating economies could be effected.

For these reasons we believe that if we must make a choice between two alternatives, both of which are objectionable, the proposal of the commission to join us with these lines would be more helpful in the public interest than the suggestion of Professor Ripley that the Lackawanna be included in proposed consolidation System 5.

L. F. Loree for the D. & H.

L. F. Loree, president of the Delaware & Hudson, objected to the "artificial stimulation of consolidation" on the ground that "in all history artificial and radical interference with economic order has invariably resulted in suffering and disaster," and he suggested that the commission might recommend a repeal of the law and the substitution of a clause exempting consolidations approved by the commission from the anti-trust laws. Commissioner Hall interrupted to say that the function of the commission is to carry out the mandate of Congress and Mr. Loree omitted the reading of part of his statement, although it was made part of the record.

Mr. Loree said in part:

Appearing as the representative and fiduciary of the owners of $200,000,000 of capital, all of which must be profoundly affected by the execution of the gigantic and, in every industrial and economic as well as political sense, the revolutionary plan which has been tentatively proposed, I should feel seriously remiss if I omitted to express my surprise and regret that the stage of a formal hearing has been reached with so slight foundation in the data available to those who must deal with the subject, and in the formulation and statement of the principles upon which the Interstate Commerce Commission proposes to act.

The history of the commission affords no evidence that it has ever hesitated to inform Congress of its disapproval of legislative policies. It is, therefore, appropriate to suggest the inquiry whether the repeal of the statutory provision under which this proceeding is held ought not to be recommended and urged with that persuasive force which, in the past, has so often and so remarkably influenced the course of legislation.

The situation with which the whole public, no less than that large and inseparable portion which is engaged, in one way or another, in supplying railway transportation, is confronted, as the result of this extraordinary legislation, is both threatening and strange. For a third of a century, from 1887 to 1920, intercorporate co-operation in the railway industry, when involving properties even potentially competitive, was forbidden and penalized. Suddenly, and for no more conclusive reason, so far as any public record or discussion suggests, than that there was an awakening to the fact that artificial restraint of co-operation had worked badly, it appears to have been concluded that artificial stimulation, amounting even to duress, should be substituted. But the failure at one extreme does not prove or even indicate that resort to the opposite extreme will prove successful.

The present proposal is violently disturbing and every step in its execution, if it is ever executed at all, must be accompanied by impairment of the public welfare in a degree that may amount to disaster. Even in its present stage, the plan is an insidious blow at the railway industry and at the fine body of men who have devoted long years and arduous toil to the service of the public.

There is no real ground for believing that the economies which seem vaguely to be imagined will be realized. There is no evidence that large properties have been in the past, or will be in the future, more cheaply, efficiently or satisfactorily operated than small properties. Certainly the prophesied economies of federal control were not realized.

The union of a road strong financially with a weak road is not certain, as seems to be assumed, to produce a strong combination. The strength of the whole cannot be greater than the sum of the parts reduced to a weighted average. Moreover, among the 261,000 miles of railway in the United States, there is some mileage that is as useless and obsolete as the sailing ships which were abandoned when the supremacy of steam was established upon the ocean. If there are 30,000 miles, probably no exaggerated estimate, which ought to be abandoned and written off within the next decade, it is certainly not desirable that their uneconomic survival should be assured by making their preservation a parasitic charge upon mileage that has real economic justification.

The avowed purpose to make the strong roads support the weak is, in its last analysis, to drain and divert the earnings derived from the business of certain communities or regions, to the support of inadequately compensated services rendered in behalf of other communities or regions. The proposed transfers are so palpable that it does not seem that they can be concealed from the farmers, manufacturers

and others who will be asked to surrender their advantages, nor possible that the victims can remain content under such a high-handed appropriation of their assets.

Doubtless there are some skilful combinations of properties which would tend towards improved service, but the really great improvements wait upon the action of this commission and other authorities. The causes of delays and interruptions in service and the remedies therefor are well understood. Light car loading and minimum weight regulations, small daily mileage of cars and inadequate private siding facilities on the part of shippers and consignees, the lack of a sliding demurrage scale sufficiently severe to accomplish its purpose, failure to provide for increased demurrage from cars moving under "to order" bills of lading and for cumulative and increasing demurrage upon cars that are re-consigned, are the principal causes for which remedies should be applied. There should, also, be a review of the car-ratings of mines and rules properly adapted to control shippers' orders for cars, with penalties for misinformation and excessive demands. "Sailing-days" and systems of collection and delivery should be re-organized and adjusted to the requirements of a more economical utilization of motive power, equipment and tracks. Vigorous action on the part of the commission in penalizing abuses would go much further in producing healthy conditions than any scheme of consolidation.

A Proposal for Substitute Legislation

It appears to be agreed, upon all sides, that the restrictions upon co-operation were ill-advised, and that their abandonment had become plainly necessary in 1920. If the commission should determine to recommend the repeal of the consolidation provisions of the transportation act, 1920, it would not wish to recommend a return to the evils that were recognized when it was passed. As an alternative, I suggest consideration of the remedy proposed by the late Senator Foraker, early in 1906:

"That nothing in the act to regulate commerce, approved February 4, 1887, or in the act to protect trade and commerce against unlawful restraints and monopolies, approved July 2, 1890, or in any act amendatory of either of said acts, shall hereafter apply to the establishment of rates or the changing or publication of the same with respect to foreign commerce, or shall prohibit any necessary reasonable agreement of two or more carriers with respect to rates or charges and the maintenance and observance of the same for interstate transportation that is not in unreasonable restraint of trade or commerce with foreign nations or among the several states.

With the addition of a clause exempting consolidations approved by the commission from the prohibitions of the Sherman Act, the foregoing would permit all essential co-operation and work in the interest of efficiency and the general public welfare. With the removal of the legal obstacles, whatever natural tendency there may be toward co-operation and consolidation would develop neither too rapidly nor too slowly, the necessary adjustments would be accomplished with minimum interference with industrial or financial equilibrium and the process would be better in its incidents and results than any artificial plan.

Attention has already been called to the fact that Congress did not indicate the number of systems which was to be considered "a limited number." The reports of the commission indicate the existence of 188 so-called Class I railroads. It is well known, however, that this in no way reflects the actual condition. There are actually 89 separate properties rather than the 188 which superficially appear. It would seem, considering the friction and loss that inevitably attend revolutionary changes in the economic organization of a nation, that, at least for the present, the requirements of the statute would be fully satisfied if the commission would recommend the early consolidation of the present systems so that each of them would be represented in its public relations by a single corporation. It is believed that the results thus obtained would be infinitely superior to an immediate reduction to 19 systems obtained under substantial duress.

Details concerning the flow of traffic upon the different routes affected, essential to estimates of the rate of its growth, the ascertainment of its direction, character, etc., were not called for until after the order of August 3, 1921, was entered. I respectfully submit that such data should have been collected, tabulated, graphically illustrated and accompanied by comprehensive studies of the physical characteristics of the different regions; the operating characteristics and conditions of the several carriers; the location, nature and the extent and distribution of the different reservoirs of traffic, as a preliminary to the formulation of any plan, not for use in support of consolidations previously determined upon.

If this had been done, the commission would not have placed emphasis upon access to cities but rather upon access to traffic producing regions. Package freight originates largely in cities and so do some classes of manufactured products that move in carload quantities, but the great bulk of railroad freight consists of coal, coke, mineral products, grain, lumber, etc., and does not originate in urban centers. Access to traffic, and not access to cities, is the first essential of a sound economic foundation for a railway sytem. No consideration having apparently been given to this controlling principle of railway economics, the plan lacks the necessary basis of a sound scheme of consolidation; even if it were beyond criticism in other respects.

The plan would seem to have the effect of greatly augmenting the power of the New York Central. This is shown by the allocation of the Boston & Maine to the N. Y. C., accompanied by a provision for the perpetuation of its control of the Boson & Albany; the omission of any consideration of the West Shore separate from that system; the refusal to include the Michigan Central in the proposed Pere Marquette system, although Professor Ripley considered that "the desirability of withdrawing it from the N. Y. C. . . . is self-evident," and the weakening of its greatest rival by making the Norfolk & Western the center of an independent system.

The Delaware & Hudson would be particularly and most unfavorably affected by the proposed transformation of the Boston & Maine from an independent operating concern to an integral portion of a system which would be capable of diverting to its own rails a great deal of the traffic which now passes from and into New England through the Mechanicville gateway.

The Delaware & Hudson Company is under duress. Its owners believe that it is performing its common carrier functions in an efficient and satisfactory manner and that the charges which it collects are no more than reasonable, however measured. They believe that while these conditions continue they are entitled to whatever measure of profit its location, physical characteristics, cheap fuel, economic working and skilful supervision may produce; that anything less would be to reduce it to a servitude wholly obnoxious to American principles. The owners believe that, as a corporate entity, it is entitled to be allowed, without interference, to discharge the duties undertaken when its charter was granted by the state of New York, more than one hundred years ago, and which were contemplated when capital was raised for its construction and operation. They look with apprehension upon consolidation academically conceived and arbitrarily imposed and they anticipate no advantage of any kind, for themselves or for the public which they serve, from the provision of the transportation act under which this proceeding is being conducted. Notwithstanding this, if there is to be a general consolidation of the railways operating in the region occupied by their properties, it is obvious to them, as it must be to others, that their railway, if left isolated and alone, would suffer to the extent of disaster.

Consolidations Suggested by Mr. Loree

Contrary to a general public impression, there is no proposal, in the "tentative plan" or by Professor Ripley, to create a single system embracing all New England lines. Perpetuation of the control of the New York Central over the Boston & Albany, and that of the Grand Trunk (of Canada) over the Central Vermont, as well as the continued ownership by the Grand Trunk and Canadian Pacific of their railway properties in northeastern New England, seems to have been accepted without question. The consolidation, into a single system, of the remaining New England railways is, however, one of the proposals and, as to this, it is necessary to observe that the power of such a combination to divert an important volume of traffic, at its pleasure, from one connection to another, would confer an opportunity to extort unfair and excessive divisions which would certainly be utilized and which ought not to be permitted. The control of traffic originating on one such railroad has, in the past, been utilized to produce precisely that result, that company receiving as much as one-fourth of the total earnings for a haul of 150 miles out of a 1,000 mile haul. Sixty-one per cent of the traffic of New England railways is interchange traffic, to or from Trunk Line connections. I have, therefore, two suggestions to make as to New England, as follows:

1. That the New England railways located north of the Boston & Albany (the Boston & Maine, Maine Central, Bangor & Aroostook and Central Vermont) be united with those of the Delaware & Hudson Company, or,

2. That the New England railways located north of the Boston & Albany be united with those of the Boston & Albany and that the Delaware & Hudson and the New York Central become owners of equal interests in the consolidated property.

For many years no trunk line railway extended westward

of the trunk line termini, Buffalo, Tonawanda, Salamanca, Pittsburgh, Wheeling and Parkersburg, and although the Vanderbilt family and the Pennsylvania Railroad acquired interests in lines further west, the former becoming dominant even in the Chicago & Northwestern and the latter adventuring towards the south, by investing in the Richmond & Danville, predecessor of the Southern Railway, it was long before those holdings eventuated in unified ownership or common management and operation. Even today the Delaware & Hudson; Delaware, Lackawanna & Western; Lehigh Valley; New York, Ontario & Western, and other trunk lines, seem satisfied to remain east of the western trunk line termini.

Professor Ripley notes that the Delaware, Lackawanna & Western, in particular, has had opportunities to extend its sphere west of Buffalo and has found the expansion undesirable. It is suggested, therefore, that the trunk line termini still constitute a natural boundary between eastern and central systems and that if these gateways are left as open to competition in the future as they are at the present it might be eminently desirable to maintain this boundary between the consolidated systems to be created. If this suggestion should be accepted, the following would, it is believed, constitute a useful, efficient, and self-sustaining system:

Delaware & Hudson; West Shore; Delaware, Lackawanna & Western; Lehigh Valley; Buffalo, Rochester & Pittsburgh; Philadelphia & Reading (one-fourth interest); Central Railroad of New Jersey (one-fourth interest).

Although it is my own opinion that it would be better to extend none of the consolidated systems reaching the Atlantic seaboard beyond the established trunk line termini, as just indicated, the commission appears to have adopted the views of Professor Ripley, and to have favored their extension to Chicago and the Mississippi river. I feel impelled, therefore, to suggest a further consolidation, in case the foregoing is not acceptable, which would extend as indicated, including the following railroads: Delaware & Hudson; West Shore; Delaware, Lackawanna & Western; Lehigh Valley; Buffalo, Rochester & Pittsburgh; Philadelphia & Reading (one-fourth interest); Central Railroad of New Jersey (one-fourth interest); Bessemer & Lake Erie; Wheeling & Lake Erie; Pittsburgh & West Virginia; Western Maryland; Wabash; Grand Trunk (lines west of Sarnia and Detroit River).

J. H. Reed, president of the Bessemer & Lake Erie, which in the tentative plan is placed alternatively in System No. 4 or System No. 5, expressed the opinion that the road should be left independent. He said that the steel corporation gets no advantage over its competitors by its control of the road, and he did not care whether the road were placed with the Erie or with the Nickel Plate although it would be more of a benefit to the latter.

H. S. Hastings, receiver of the Pittsburgh, Shawmut & Northern, said that it seemed neither necessary nor expedient to present testimony for this road, but that it might do so later.

System No. 5—Nickel Plate-Lehigh Valley

System No. 5 in the tentative plan includes the Lehigh Valley; New York, Chicago & St. Louis; Toledo, St. Louis & Western; Detroit & Toledo Shore Line; Lake Erie & Western, Wheeling & Lake Erie; Pittsburgh & West Virginia and Bessemer & Lake Erie.

C. E. Hildum, comptroller, and M. C. Cleveland, valuation engineer, submitted exhibits containing the basic data for the Lehigh Valley and E. H. Boles, vice-president and general counsel, made a general statement regarding the attitude of the company toward the plan, which, he said, was similar to that taken by Mr. Jenney and for the same reasons. He doubted whether Systems No. 4 and 5 either as set forth in the tentative plan or as proposed by Prof. Ripley could successfully compete with the proposed Systems 1, 2 and 3. He expressed the opinion that the Lehigh Valley could better serve the public if it had a connection to Philadelphia. Mr. Boles said he was less pessimistic than Mr. Jenney regarding a combination of the Lehigh Valley or the Lackawanna with the Nickel Plate, but thought it would be weak as compared with the proposed New York Central, Pennsylvania or Baltimore & Ohio systems. The traffic people, he said, thought there might be some advantages in being a sole Buffalo line, but that this would be experimental and perhaps might be too dangerous to undertake. The Lehigh has no substantial reasons for or against System No. 5, except the lack of terminal facilities of the Nickel Plate at Chicago. It thinks a system might be built up which might prove more in the public interest by taking in the Michigan Central, the Buffalo, Rochester & Pittsburgh and the line of the North Pennsylvania from Bethlehem to Philadelphia.

W. A. Colston, vice-president and general counsel of the New York, Chicago & St. Louis, said that the company is in full accord with the proposal to consolidate the railroads into a limited number of systems and has no objection to offer to the inclusion of its lines in proposed System No. 5, but urged that the plan be left sufficiently flexible to permit of modifications. He said the company had shown its intentions by its acts, but that it believes that paragraphs 4, 6 and 8 of Section 5 of the interstate commerce act comprehend a plan for relieving carriers from the restraints and prohibitions which have heretofore prevented co-ordination of railroads and do not require new restrictions where they did not exist before. This was in line with the argument made at the hearing last week on the New York, Chicago & St. Louis consolidation, in which Mr. Colston contended that the commission is without jurisdiction to interfere with a consolidation authorized by state laws. As a substitute for the commission's System No. 5, Mr. Colston suggested a combination of Systems 4, 5 and 8, the latter including the Chesapeake & Ohio, in which the Nickel Plate interests have recently secured an interest, with various modifications. The D., L. & W., or the Lehigh Valley, Mr. Colston said, might be given either to the proposed combination or to System No. 7-a and the Ulster & Delaware, Pittsburgh & Shawmut and Pittsburgh, Shawmut & Northern taken from No. 4 and placed in 7-a. The Lorain, Ashland & Southern under his proposal would be taken from No. 4 and put in No. 2 and the Wabash would also be taken from No. 4 and assigned to another system. The Pere Marquette or the Grand Trunk Western would also be placed in the proposed system to give it access to the Michigan peninsula. Such a system, Mr. Colston said, might be able to compete with the Pennsylvania or New York Central.

F. P. Barr, general traffic manager of the Wheeling & Lake Erie, submitted the statistical information desired by the commission, but said the company was not prepared at this time to make a definite recommendation as to whether or not it should be consolidated with any other railroad or railroads and if so with what railroads it should be joined.

John F. Dickie, auditor and treasurer of the Buffalo, Rochester & Pittsburgh, said that the road would add strength to any group in which it might properly be placed, but that it exchanges comparatively little traffic with the roads of either System No. 5, in which Professor Ripley had included it, or No. 7-a, to which it had been assigned in the commission's tentative plan. The interchange would probably be as great, in his opinion, if it were not included in those systems and a better allocation would be to some system which would afford the road more southbound traffic to balance its northbound coal movement.

Pere Marquette System—No. 6

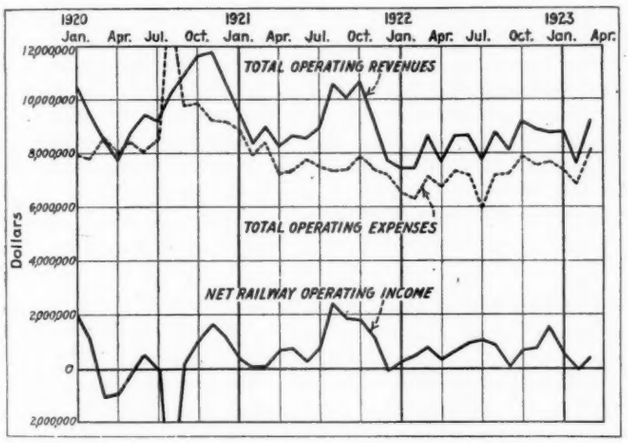
F. H. Alfred, president of the Pere Marquette, said that proposed System No. 6—Pere Marquette; Detroit & Mackinac; Ann Arbor; Detroit, Toledo & Ironton, and Boyne City, Gaylord & Alpena, would not be sufficiently strong financially and that the problem is to supplement it with other lines that will bring it financial strength so that it may be self-supporting. The other lines would drag down the Pere Marquette's percentage of net return, he said. To correct this condition, he suggested that the system be supplemented by the inclusion of System No. 9—Norfolk & Western, and also the Delaware, Lackawanna & Western, and possibly the Wabash lines east of the Mississippi.

Missouri Pacific Progress Hindered by Strikes

Power Shortage Prevents Road from Securing Increased Traffic in Fall Months of 1922

A PROPER ATTITUDE towards the Missouri Pacific would be, it is believed, one of interest as to what may be accomplished during the next few months by its recently elected president, L. W. Baldwin. Mr. Baldwin has a task confronting him that will demand his utmost and he will have occasion, we doubt not, to feel extremely appreciative for the training as an operating executive which he has received as one of the officers of such a well-managed property as the Illinois Central.

The Missouri Pacific has had extremely hard going for the past several years. Reorganized in 1917, it did not have

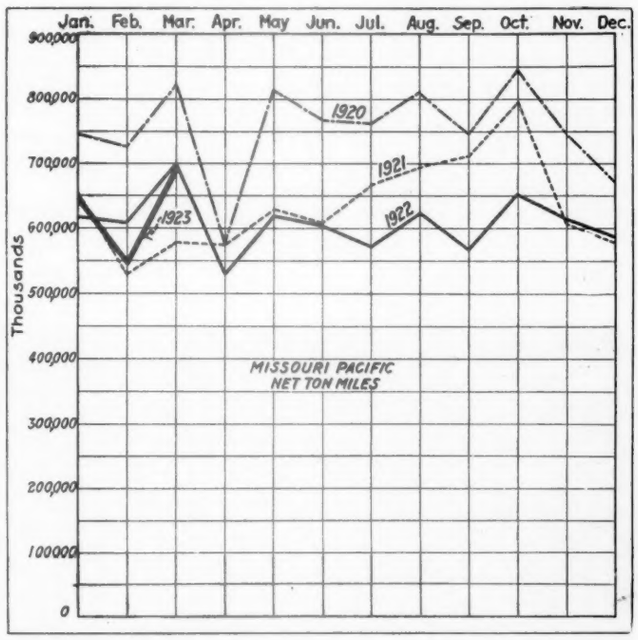


time to get on its feet before the period of federal control began and introduced into its affairs all the complications by which the federal control period was characterized. The property had a standard return of 14 million dollars of which it earned for the government in 1918 about 12 million and in 1919, only about 4¼ million. Standard return and guaranty in 1920 had to compensate insofar as they could, for a deficit after rents of 4½ million. In 1921 there were some indications of recovery and for that year the road had a net operating income of $9,884,376. This improvement, however, was not continued into 1922. The net operating income for that year was $8,247,035. The coal strike and the railway shopmen's strike proved unduly severe on the Missouri Pacific and it is only in very recent months that there have been in evidence any real signs of recovery from the 1922 situation.

When the Missouri Pacific was reorganized in 1917, its fixed charges were reduced to some extent. As of June 30, 1915, the capital stock outstanding totaled approximately $82,750,000 and the funded debt, $279,500,000. The interest charges for the year were $13,300,000. The reorganization reduced the funded debt to $227,000,000 and there was created an issue of preferred stock totaling $71,800,000. This preferred issue is 5 per cent cumulative from July 1, 1918, but no dividends have, as yet, been paid. The reorganization plan reduced the interest charges to $10,000,000 although at the present time they amount to $11,800,000, the increase being primarily due to indebtedness arising from federal control.

In 1922 the Missouri Pacific failed to earn its fixed charges and its corporate income account showed a deficit for the year of $1,413,712. In 1921 there was a net of $3,537,016, but there was included an item of $1,972,081 as government guaranty. These figures do not inspire optimism as concerns the Missouri Pacific situation. What there is in the way of a redeeming feature is the fact that the 1922 conditions were very abnormal. The Missouri Pacific was in a position to be particularly hard hit. It serves the southern Illinois coal fields. It is one of the best located carriers in that area and bituminous coal normally constitutes about 20 per cent of its total tonnage. In 1922, the road moved 4,125,064 tons of bituminous coal and this constituted 15.70 per cent of its total tonnage. The volume was less than was carried in 1921, in which year the tonnage totaled 4,848,059, or 17.93 per cent of the total tonnage and was very much less than the volume handled in 1920, when the tons of coal were 7,047,642, or 20.75 per cent of the total. One would hardly expect the Missouri Pacific to show any remarkably good results with a situation of this kind.

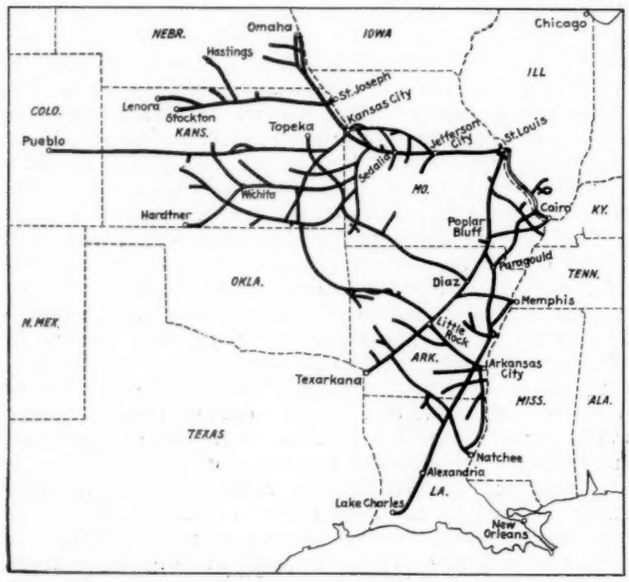
It happened, however, that the Missouri Pacific was very vitally affected by the shop strike; so vitally affected, in fact, that there is a question in some quarters as to whether the financial position of the railroad was such as to make one feel that the management was right in fighting the rail-



way shopmen as bravely as it did. There are, of course two sides to any such question as this and it might well be expected that in a few years the results of this policy will be reflected in reduced maintenance of equipment expenses. Whatever one may believe, the fact remains that the results showed very adversely in the 1922 earnings. The shop strike was so severe that the Missouri Pacific on September 1 had a percentage of locomotives held for repairs requiring over 24 hours of 31.8 per cent and even on May 1, 1923, it has reduced this percentage to only 26.4. This power situation, of course, meant that the Missouri Pacific was unable to handle properly the traffic which was available during the latter part of 1922. It is of interest that in only

one month of 1920, April, the month of the outlaw switchmen's strike, were the net ton-miles less than they were in any month in 1922, or in any of the months so far in 1923, with the single exception that the net ton-miles in March of this year exceeded those of December, 1920.

It will be borne in mind that the reductions in rates which



The Missouri Pacific

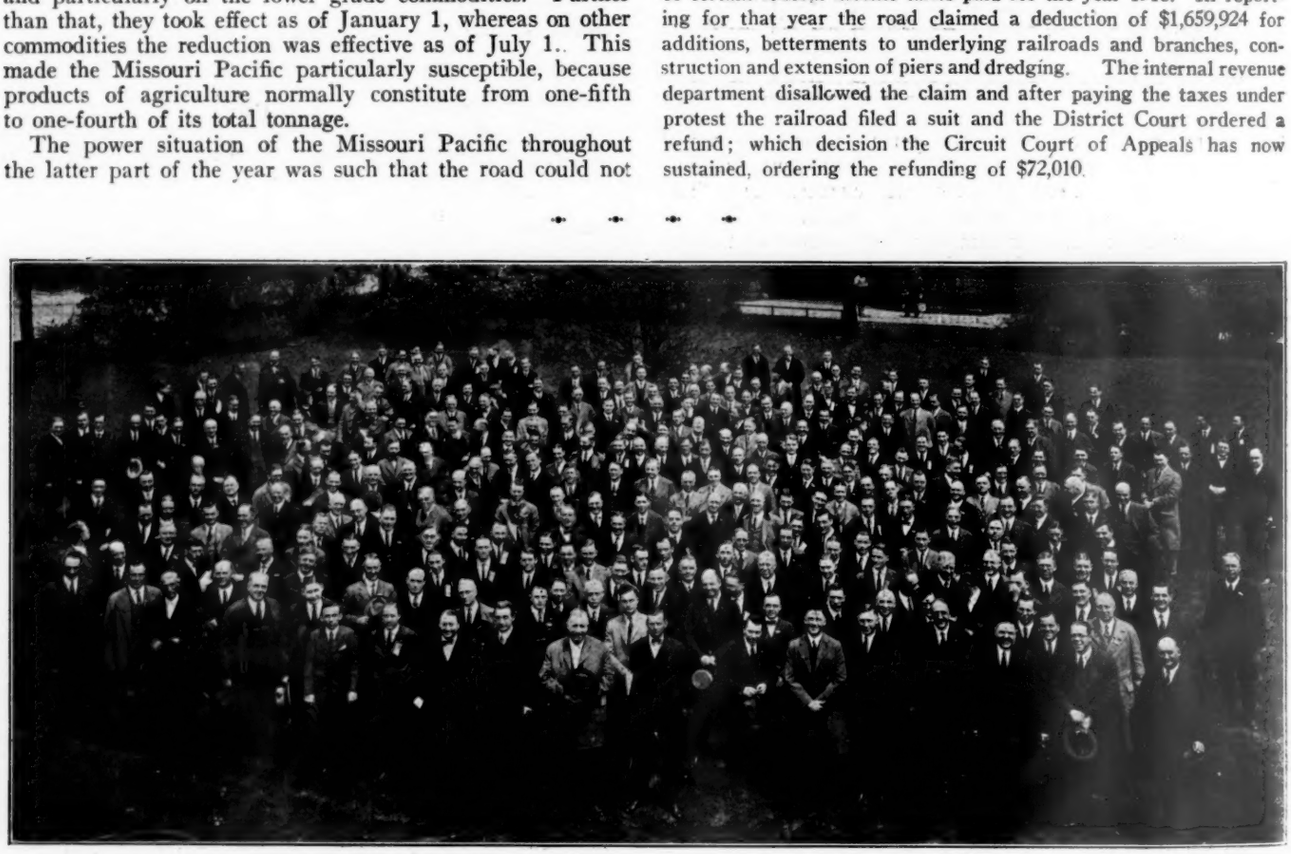
took effect in 1922 were greatest on products of agriculture and particularly on the lower grade commodities. Further than that, they took effect as of January 1, whereas on other commodities the reduction was effective as of July 1. This made the Missouri Pacific particularly susceptible, because products of agriculture normally constitute from one-fifth to one-fourth of its total tonnage.

The power situation of the Missouri Pacific throughout the latter part of the year was such that the road could not handle its business properly. The annual report makes a definite admission of this fact when it says: "These reductions (in traffic and earnings) are attributable to the labor disturbances referred to above; the reduction in coal tonnage being a curtailment of traffic, while the reduction in products of agriculture and building material resulted largely from shortage of equipment and transportation disabilities growing out of the inability to keep locomotives in adequate repair by reason of the railway shop force being almost totally depleted by the strike."

The tonnage of products of agriculture in 1922 was 13.1 per cent less than in 1921; the products of mines were 11.62 per cent less; the total tonnage was 3.31 per cent less. There was a decrease of 6.79 per cent in revenue ton-miles and as a result of the decrease in rates, total railway operating revenues were 9 per cent less. Fortunately, the management was able to secure some compensating results in the form of decreased operating expenses, the percentage of this reduction being 7.95 per cent. The larger share of the decrease was in transportation, but there was also a decided cut in maintenance of equipment.

This does not paint a very favorable picture of Missouri Pacific operations and it is believed that the evidence presented bears out in no uncertain terms the suggestion that the new executive has no easy task before him. There should be little question, however, that the worst in the Missouri Pacific situation is past, and it seems very reasonable to believe that the road should be able to realize in some measure on the results of the contest which it staged with its shopmen during the past year.

THE CENTRAL OF NEW JERSEY has won its suit for the refund of certain federal income taxes paid for the year 1916. In reporting for that year the road claimed a deduction of $1,659,924 for additions, betterments to underlying railroads and branches, construction and extension of piers and dredging. The internal revenue department disallowed the claim and after paying the taxes under protest the railroad filed a suit and the District Court ordered a refund; which decision the Circuit Court of Appeals has now sustained, ordering the refunding of $72,010.



Purchases and Stores Division, A. R. A., at Hawthorne Works of the Western Electric Company, Chicago, for an Inspection Trip on the Occasion of the Annual Convention, May 15, 16 and 17

Fuel—A Reducible 13 Per Cent of Expense*

A Notable Comprehensive Review of the Present Fuel Situation and the Future Outlook

By J. Kruttschnitt
Chairman, Executive Committee, Southern Pacific

THE UNITED STATES GEOLOGICAL SURVEY warns us that we have been depleting those of our coal deposits most easily mined at a steadily increasing rate: That we have mined more coal in the last 12 years than in the preceding 150.

With the upward trend of labor and material costs and difficulties of mining, the cost of coal must rise steadily in the future, and these considerations should stimulate its provident use. In 1921 the railroads used approximately 137,000,000 tons, or 27.3 per cent of the total production of bituminous and anthracite coal in the United States, and its cost of $594,479,000 constituted 13 per cent of total operating expenses. Let us try to visualize the coal represented by these figures, which are bewilderingly large.

We have come here to study how to make our railroads more efficient public servants, and to devise how to save as much as possible of the 13 per cent of operating expenses represented by fuel cost. Too often efforts to save fuel go no farther than to criticize the work of the men directly charged with its consumption, and thereafter to rest under the smug impression that we have done our full duty. While all recognize the great influence of the work of the locomotive fireman who furnishes the steam to run our trains, and of the engineer who applies it to vitalize inert steel and iron, on net earnings, we shall show how substantially every man in railroad service from the chief executive to the humblest private who guards our permanent way, shares in the credit or discredit of operating results.

Fuel is the largest item of material expense on a railroad, and however efficient our firemen and engineers may be, their efforts would fall far short of the desired end without the perfect co-ordination of every department in the plant, all of which influence cost of output. The activities of a railroad are centered in the following departments; each must function efficiently alone and also in connection with all others, in order to attain the greatest measure of success:

Executive Department

"The location of a railroad is giving it its constitution. It may be sick almost unto death with accidents of construction and management, but with a good constitution it will ultimately recover." The executive department must determine the location of the railroad between the termini that the railroad is to connect; it prescribes the amount of money to be spent on construction; fixes the grade and curve systems, because the ideal railroad, between given points, would be absolutely straight and of uniform grade, that is, devoid of undulations in alignment or profile. The locomotive's consumption of fuel will increase in proportion to the grade and curve resistance involved in departures from the ideal line. Whenever a ton weight is lifted one foot, an amount of work equivalent to moving it 333 ft. over a straight level track is spent; and every time a ton weight of train is forced through 100 ft. of one-degree curve, the work done in deflecting it from a straight to a curved path is equivalent to moving the same ton over 16⅔ ft. of straight, level track. The old line of the Central Pacific between Ogden and Lucin, Utah, in a distance of 146.7 miles had 4,260 deg. of curvature, and rose 1,906 ft. westbound. The new line, the Lucin Cut-off, in 102.9 miles has 341 deg. of curvature and rises 390.2 ft. westbound. The equated straight, level track is 280.2 miles for the old and 128.6 miles for the new line. It takes one pound of coal on the new to move as much as 2.2 pounds of coal moved on the old line.

The executive department must determine the justifiable outlay to reduce grades and curvature on existing lines, as obviously the expenditure necessary to obtain a straight line between two points without any undulations in grade might be commercially prohibitive. It is, therefore, of the greatest importance for the commercial success of a railroad to balance the money cost of approaching as nearly as possible ideal conditions against the expected advantages.

Fuel economy can often be effected by expensive physical improvements, such as installing automatic block signals, redesign of terminals, modernizing roundhouses so as to utilize the residual heat from incoming locomotives to raise steam on outgoing ones, and by increasing the number and lengths of sidings to save delays on the line. On the executive rests the responsibility of balancing the interest, maintenance and depreciation costs on large capital expenditures against possible savings, and of providing the necessary capital if the investment is justified.

Accounting Department

The accounting department keeps track of earnings and expenses, records the history of operations, and acts as general inspectors to expose poor results as a prerequisite to correcting them. No expense should be spared in publishing promptly all data that showed results of operation. The record traffic handled with record efficiency in 1917 was the response of the railroads to the monthly data sheets first issued by the Railroads' War Board, which now are issued in even more detail by the Interstate Commerce Commission and the Bureau of Railway Economics. Fuel accounts kept with individual engineers and firemen and locomotives furnish railroads with data from which to decide definitely what type of locomotive is the most economical for their use, and whether the expense of applying and maintaining some of the many fuel-saving devices is warranted. While the experience of the men who make the decisions will usually keep them from going far wrong, yet in matters involving millions in both capital and operating expenses, a railroad officer should not be satisfied unless he has definite figures on which to base decisions.

Traffic Department

The traffic department sells the output of the railroad plant, and its contracts as to loads in cars and character of service exert a profound influence on the total amount of fuel consumption.

On a level grade at a speed of 20 miles per hour it requires 460 lb. of tractive effort to haul 50 tons in *two* cars of 21 tons' weight; it requires only 270 lb. to haul 50 tons in *one* car of the same weight, or 41 per cent less. To haul the same car and contents at 40 miles per hour increases

*Abstract of the opening address at the convention of the International Railway Fuel Association, Cleveland, Ohio, May 21.

traction from 270 to 412 lb. or 53 per cent; hence the importance of heavy carloads and moderate speed.

Maintenance of Way Department

As the resistance to traction of locomotives and cars varies between wide limits with the condition of the track, the maintenance of way department can greatly reduce expenditure of energy and fuel in moving trains. The train resistance figure commonly used of 6 lb per ton at low speed assumes track in good condition. It may very easily be two or three times that amount on poorly maintained track, laid with light rail in bad surface and with low joints, etc. The heavier the rail and the better the ballast, the easier it is to maintain good alignment and surface, the less will be the deflection under loads, and the less will be the work required to force the wheels out of the depression caused by weak and yielding joints.

Maintenance of Equipment Department

About one-fifth of all locomotive coal, or 25,000,000 tons, in 1921 was consumed when the locomotive was not doing useful work: In firing up, in waiting for trains, in standing on sidings and passing tracks, in delays at terminals, drawing fire and waiting at ashpits.

While this consumption is not directly productive, it is, of course, not all to be regarded as waste. Locomotives must be fired up and their fires must be cleaned, but substantial economy results from using steam blown off incoming to heat up outgoing locomotives. A certain amount of time must also inevitably be spent in yards, terminals and sidings. All these are essential activities incident to operation, but since so large an amount of coal is involved it is clearly important that these periods should be reduced to a minimum.

This is part of the fuel conservation problem that no one department solely controls; the chief responsibility lies with roundhouse forces, transportation officers and despatchers, who, by the exercise of forethought and close attention to details of grooming and assigning locomotives, can achieve substantial results.

Of every 100 lb. of coal burned while locomotives are running 70 lb. are applied in making steam; 14 lb. go out of the stack as waste heat in gases; 8 lb. go out of the stack as cinders; 4 lb. go out of the stack as unburned gases, and 4 lb. go into the ashpan and ashpit.

These figures are based on *good* performance, which, of course, is much better than the *average* of all the locomotives in the country.

The losses in the last four items total 30 per cent and indicate directions in which efforts to save fuel should be made. While it is impossible to eliminate any of these losses entirely, each may be reduced by methods of proved merit.

The remaining 70 per cent of the heat in the coal is stored in the steam. Of this store, 52 parts are lost in the steam exhausted from the stack, on its way to perform some useful work in creating draft; 5 parts are lost in radiation; 7 parts are lost in operating air-pumps, injectors, blower and other auxiliaries, and 6 parts are used in useful work applied at the locomotive drawbar.

The percentage of useful work can be increased from 6 per cent to 8.1 per cent, or 35 per cent, by the use of methods and devices that we shall enumerate.

With the increase in the power of locomotives and the use of higher steam pressures, mathematical talent to replace rule of thumb has been called on to compute stresses and to proportion parts. Questions as to adoption of alleged improvements are difficult to decide, as they involve first cost, interest, maintenance and depreciation, their possible effect on engine failures and the idle time of the locomotives while they are undergoing repairs. Sometimes economy of operation is sacrificed to facilitate adjustment and repairs, as when outside valve gears replaced link motion.

The practice of buying locomotives regardless of their adaptability to special service, as was done during federal control, simply because they can be built in quantity at some reduction in cost, is recognized by competent judges as the poorest kind of economy.

While it is customary to speak of the waste of fuel in the average locomotive, which converts but 6 per cent of the heat in fuel into useful work, we must not forget the extremely unfavorable conditions under which it is required to work. On account of space limitations it cannot use condensing engines, and thus is deprived of the advantage of 12 to 13 lb. additional effective cylinder pressure. It is driven through all kinds of weather at high speed, so that radiation losses are very great. To meet the demands made on its boiler for steam, explosive draft must be used, which expels much unburned fuel from the firebox; the resultant effect of all of which is evidenced in low thermal efficiency. The brake thermal efficiency—or percentage of energy in fuel transformed into work—of reciprocating, condensing, stationary steam engines is (boilers excluded) 19.0 per cent; of steam turbines, 19.2 per cent; average of eight large powerplants (boilers included) 13.3 per cent; while the thermal efficiency of non-condensing steam locomotives at *maximum* capacity, equipped with proved fuel-economizing devices, is from 7.3 per cent to 8.1 per cent.

The combined average effect of the brick arch, the superheater and the feed-water heater in saving fuel on passenger and freight locomotives of various types at various speeds in actual service is given below, but we must not forget that these figures vary widely for different locomotives, speeds and classes of service:

	Average, various types and speeds
Arch	9 per cent
Superheater	20 " "
Feed-water heater	10 " "
Combined	34.5 " "

These three devices are of proved value and are coming into extensive use; however, there are others on the market whose claims have not yet been thoroughly substantiated, which may develop into valuable adjuncts to the locomotive.

The savings claimed for the various fuel-saving devices are gross figures. The cost of applying them is quite large, and in some cases not justified by the age or obsolescence of the locomotive; in others, is beyond the financial ability of railroads to apply them; hence we must be careful to balance cost of interest, maintenance and depreciation against the value of the fuel saved. The *net* saving so determined—not the *gross*—will show whether the money to provide the appliance can be providently expended or not. Experience shows that thus tested the gross saving of superheaters is reduced from 20 per cent to about 17.4 per cent; of feed-water heaters from 10 per cent to about 6 per cent.

Under normal conditions a locomotive can haul as much, or even more, load than it can start. The booster can add about 10 per cent to the drawbar pull of heavy freight and as much as 25 to 35 per cent to the drawbar pull of lighter passenger locomotives.

However excellent may be the design of the locomotive, close and unremitting attention to the numberless details of operation is necessary to obtain the maximum work with minimum consumption of fuel. We can touch on the principal ones only in the limited time at our disposal.

After selecting the softest natural feed waters, such others as we may have to use should be chemically treated to reduce objectionable impurities to a minimum. A conservative estimate of the effect of scale 1/16 in. thick on flues is to increase fuel consumption 10 per cent. The Hungarian State Railroads use on 3,000 locomotives a mechanical feed-water purifier mounted on top of the boiler. The water on entering the purifier is subjected to full boiler pressure and

temperature, and deposits its scale in and on this adjunct to the boiler instead of in the boiler and on the flues. With reduction of scale there is a direct saving in fuel consumption, while a reduction in frequency of boiler washings saves considerable time and fuel. Without the purifier, locomotives were washed on an average every five days; with the purifier, every 54 days or 5,000 miles.

All journal bearings must be carefully lubricated to reduce friction; so must the center—and side-bearings of cars, the friction of which prevents the adjustment of trucks on entering and leaving curves, and thereby in the aggregate causes a heavy increase of the resistance to traction that the locomotive must overcome. Wear on all wheels of locomotives, tenders and cars must be watched. If the treads are worn hollow or flanges worn vertical, the areas in contact with the rails when cars are oscillating or rounding curves will be increased and friction correspondingly increased. A heavy freight locomotive, tender, caboose and 60 freight cars are carried on over 500 wheels; a slight increase in the friction on a few of them only would, in the aggregate, create a heavy drag on the locomotive.

Flange lubrication reduces friction between rail and flanges, and therefore has a substantial effect in reducing fuel consumption. On two roads where flange lubrication was used, locomotive tires showed average miles between turnings of 33,000 and 44,000 miles, respectively, compared with 16,000 and 23,000 without. Wear on rails in curves show reduced wear of as high as 87 per cent. On one road of excessive curvature and grade the life of locomotive tires was increased 375 per cent with flange lubrication.

To insure full heat value the specifications for fuels purchased should cover their value in B. t. u's.

Freight cars should be fully loaded as far as may be. The resistance of a train of empty freight cars may run up to eight pounds per ton; that of cars with average loads to six pounds per ton, while that of heavily loaded cars, of total weight, 60 to 70 tons, may be as low as four pounds per ton. The load, in other words, should be carried in as few cars as possible.

As the expenditure of fuel in hauling a ton is the same whether or not it is paying freight, it is evident that the smaller the percentage of non-paying or dead weight to total weight moved, the smaller will be the fuel consumption in hauling the paying freight. The United States Railroad Administration 50-ton, single-sheathed box car weighs 47,200 lb. The American Railway Association 50-ton box car design, 42,400 lb. Based on 1921 data, the saving in fuel by eliminating this excess weight, is $9.12 per car per year.

The men who run the locomotives should understand the principle of combustion and the economical use of steam. The fireman, master of his business, will take his locomotive over a division, never allowing black smoke to leave the stack. So the experienced engineer will run uniformly, using just enough steam to maintain desired speed and will waste none in bursts of speed, which must be reduced by brake application, which means waste of power and consequently fuel. The work units expended in stopping a heavy freight train of 66 cars weighing, with locomotive and tender, 6,203,700 lb. from a speed of 40 miles per hour, is 332,000,000 ft.-lb., or 427,000 B. t. u. In storing this energy in this train a locomotive of the best type operating at 8 per cent efficiency would burn 380 lb. of coal.

Stimulation of Interest and Co-operation in Saving Fuel

Assuming that locomotives are properly maintained, in order to obtain the best results from burning fuel we must inspire the interest and secure the co-operation of the men on the footboards of our 65,000 traveling power-plants. How these ends are attained will appear from a brief of the practice on a large railroad system covering many states and operated under the most varied topographical and climatic conditions.

(Mr. Kruttschnitt described the operation of the Southern Pacific's fuel bureau which includes the issuance of individual performance records and a number of devices to stimulate competition among the enginemen, one of which is a trip to the convention of the International Railway Fuel Association for the engineer and fireman with the best fuel record from each division. This totals 38 men.)

Transportation Department

We have shown that about 20 per cent of all locomotive fuels is consumed when the locomotive is not doing useful work. The fuel losses involved in firing up outgoing and in blowing off, watering, sanding, wiping and issuing supplies to incoming locomotives occur while the locomotive is in the hands of the Mechanical Department, but these losses are directly affected by the despatch and movement of locomotives that are entirely in the hands of the Transportation Department. Other sources of fuel loss in this department are waiting for trains, standing in sidings and passing tracks, delays at terminals.

Avoidable losses from fuel used in firing up because some fuel must be used for this purpose; losses from unconsumed fuel drawn from fireboxes, from blowing off and cooling down at end of runs; losses incurred while waiting for water, sand and other supplies on roundhouse tracks can be very greatly lessened by reducing the frequency of these occasions as much as possible, and this can be done by lengthening the runs of both passenger and freight locomotives. It is not uncommon now to run freight locomotives over two or three freight divisions, and passenger locomotives over four freight divisions, before cooling them.

Electric Locomotives

Where electric current can be generated from water power, trains can be moved very cheaply, but where the current is generated in a steam plant the advantages to be derived are not so patent.

The United States Geological Survey Professional Paper No. 123 gives the best fuel rate of eight large steam-electric plants, out of a total of 400 plants studied in 1919, as 2.14 lb. of coal, or 28,000 B. t. u., to produce one kilowatt hour; hence as one kilowatt hour equals 3,413 B. t. u., the loss in converting the energy in coal into electric energy was 24,587 B. t. u., or 87.8 per cent; in other words, out of 1,000 hp. potential energy in coal, 878 hp. is lost in converting it into electric energy by the most modern and efficient steam boilers and engines driving the most efficient electric generators then known. This leaves 122 hp. available. In transmitting this power to motors of an electric locomotive the average loss is 19 per cent, or 23.18 hp., leaving 98.82 hp. out of the original 1,000 available for work; but the internal losses of the electric locomotive will consume 15 per cent of this amount, reducing to 84 hp. the energy to move trains. The efficiency of the fuel from coal to driving-wheel contact with rail is but 8.4 per cent. The corresponding efficiency of a modern steam locomotive with arches, superheater and feedwater heater is 8.1 per cent under favorable conditions. While under average conditions at the present time the advantage may be more than the 3.7 per cent indicated in favor of the electric locomotive, the spread is hardly attractive enough to tempt capital to assume the expense of interest, depreciation, tax and maintenance expenditures that would have to be incurred in changing from steam to electricity generated in a steam plant. The soundness of this conclusion was demonstrated by studies made of the Sierra Nevada and other heavy grades on the Southern Pacific, where trains are lifted 6,854 feet in 86 miles. Assuming the current generated in a steam station, the interest, taxes, depreciation on additional *net* plant required were demonstrated to be more than three times as

great as the estimated savings in operating costs to be obtained from electric operations.

Other considerations, such as smoke prevention, increasing capacity on heavy grades, may influence the problem, but we cannot recall any instance of a change being made, where a steam generated current was used, solely for saving fuel. The steam locomotive is by no means as obsolete as the propagandists for electric traction would have us believe. In an address "The Last Stand of the Reciprocating Steam Engine," published in the March, 1920, edition of the Journal of the American Institute of Electrical Engineers, a fuel consumption of 100 lb. per 1,000 gross ton-miles by electric locomotives is given as applicable "to conditions universally obtaining on regular profiles." Data published by the Bureau of Railway Economics in September, 1921, show that the fuel consumption on 24,000 selected miles of steam railroad averaged but slightly over 100 lb. per 1,000 ton-miles. Embraced in this mileage was the New York Central, Illinois Central, Chesapeake & Ohio, and St. Louis Southwestern. On 3,142 miles, or 60 per cent of Southern Pacific mainline mileage, the fuel consumption in the same month was approximately 100 lb., while on the Salt Lake Division, 543 miles, the fuel record in October, 1921, averaged 91 lb. per 1,000 gross ton-miles, for all locomotives.

It would seem that the hope of the future for conserving fuel lies in:

1. Substituting hydro-electric current for steam, as our best steam locomotives can now fully equal the efficiency of electric locomotives using current generated in steam power stations.

2. Substituting steam turbines or compound condensing or turbine condensing engines for the simple engines now used on our locomotives. From progress already made in Europe, the solution of this problem appears encouraging.

3. The discovery of a cheap, high-gravity fuel than can be used in some such engine as is used on automobiles and airplanes.

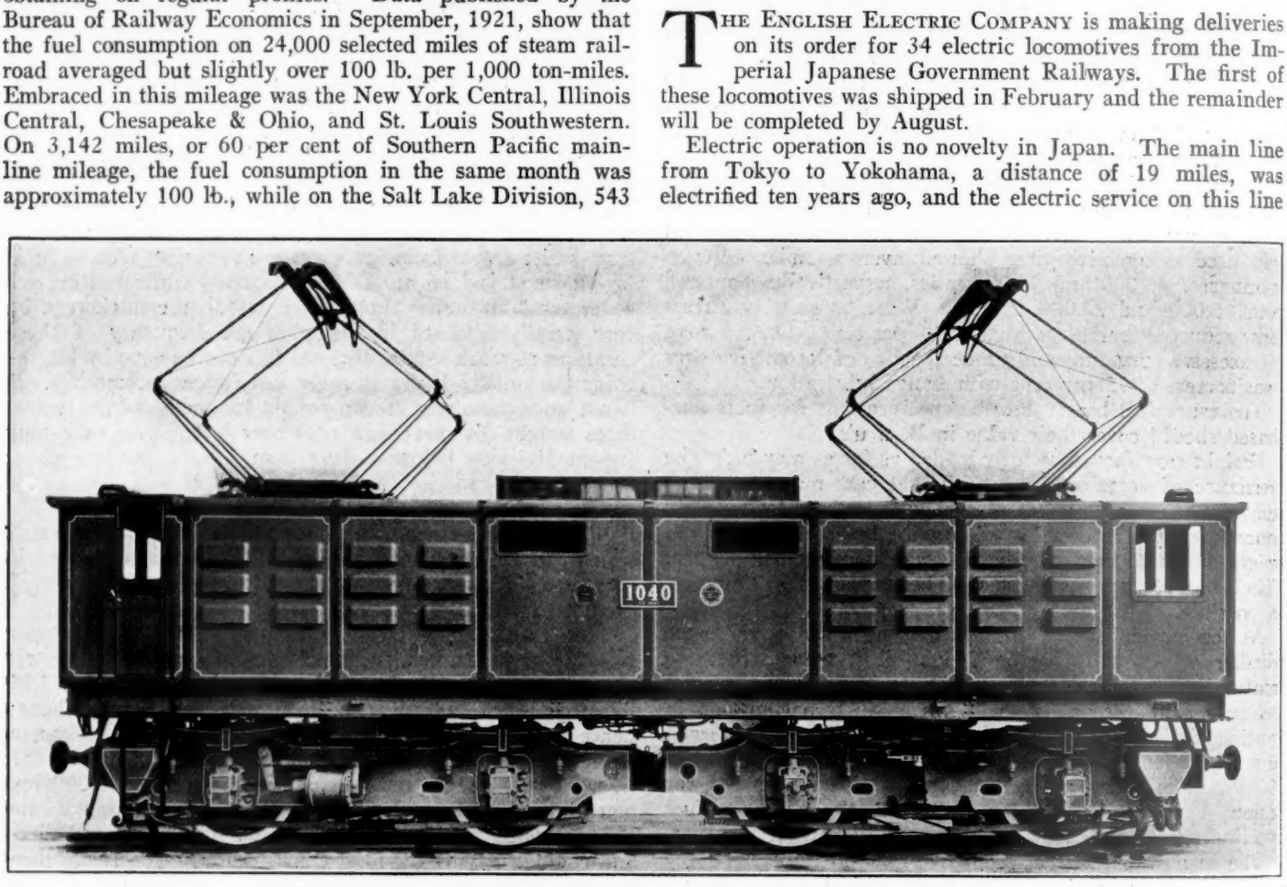
4. Reduction of the weights of Diesel engines sufficiently to permit of their use as locomotive engines. Claims have been made that by compounding Diesels can be made to weigh about one-sixth as much as they now do, but as yet these claims have not been substantiated, in the form of a commercially practicable engine.

5. The development of a satisfactory variable speed transmission gear, to couple the Diesel engine to the driving wheels of a locomotive, which will weigh very much less than the electric generator and motor, would go far towards establishing the Diesel engine as a locomotive prime mover.

British Electric Locomotives for Japanese Government Railways

THE ENGLISH ELECTRIC COMPANY is making deliveries on its order for 34 electric locomotives from the Imperial Japanese Government Railways. The first of these locomotives was shipped in February and the remainder will be completed by August.

Electric operation is no novelty in Japan. The main line from Tokyo to Yokohama, a distance of 19 miles, was electrified ten years ago, and the electric service on this line is at present being extended to the important naval base of Yokosuka. Electric trains also run on a high level loop line which connects four of the five main lines radiating from Tokyo, as well as on the suburban sections of those lines and on many privately owned railways. Apart from this the Japanese government is now converting to electric operation important sections of the main Tokaido line, which runs from Tokyo to the principal cities of Central Japan—Numadzu, Kyoto, Osaka and Kobe.



Side View of Complete Locomotive

The physical and economic conditions which justify electrification are all present in Japan. Of the 6,600 miles of railway controlled by the state, the greater part is single track and the gage throughout is 3 ft. 6 in. Traffic is heavy and rapidly increasing. In 1920, 400,000,000 passengers and 56,000,000 long tons of freight were carried by the government lines. There are many steep gradients and sharp curves, and although in recent years great efforts have been made to improve the line, the nature of the country traversed and in particular the large number of tunnels make any general doubling of the track difficult or impos-

sible. Abundant sources of water-power offer an assurance of a cheap supply of electric current.

Before deciding on their program the Japanese Government Railways investigated the electric railway systems of the world and studied the designs of electrical equipment constructed by the principal manufacturers. As a result of this enquiry they determined to adopt a high tension direct current system, and in all future work direct current at 1,500 volts with a single overhead conductor will be employed. In 1921 the railway authorities ordered two 59-ton (ton equals 2,240 lb.) freight locomotives from each of four firms, two American, one Swiss and in England the English Electric Company. In June, 1922, a contract was placed with the English Electric Company for a further order of 34 electric locomotives, this being the whole number required to carry through the program of the Japanese government up to the end of 1923. The illustration shows one of the completed locomotives. This is the largest contract for electric locomotives which has yet been carried out entirely by British manufacturers. The mechanical parts of the locomotives have been built by the North British Locomotive Company at their works in Glasgow, Scotland, and the electrical equipment at the Dick Kerr works of the English Electric Company, where each locomotive is erected for inspection and test before shipment.

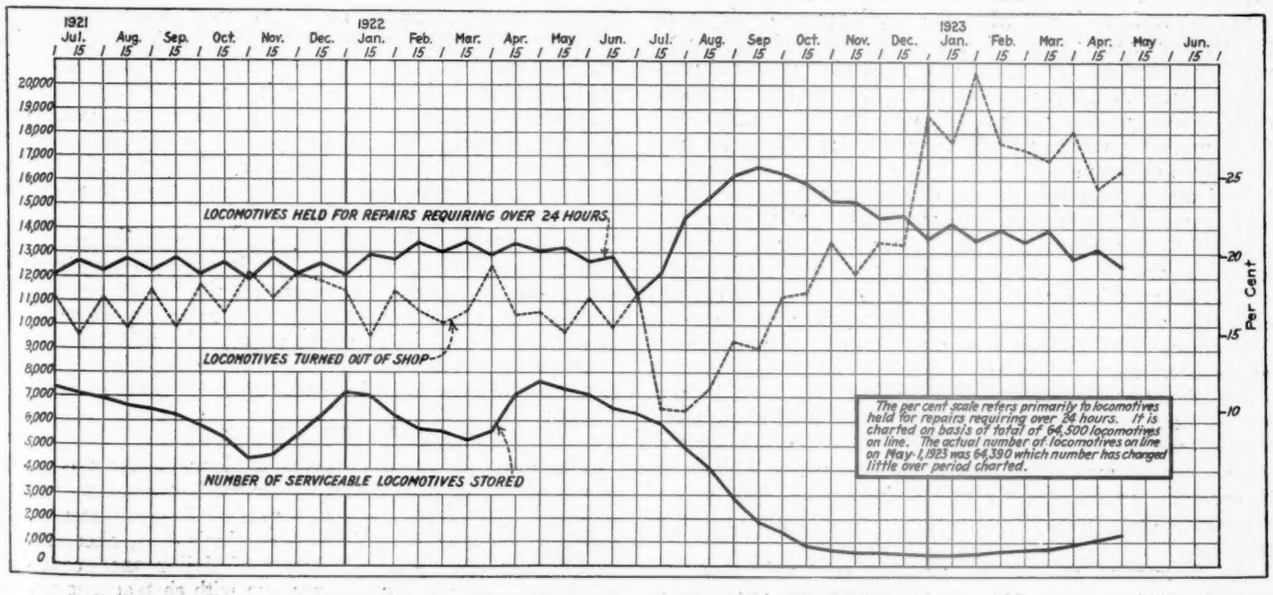
The locomotive illustrated is one of 17 which will be used entirely for freight service; 9 others are being built for hauling local passenger trains, and 8 of a heavier type for the express passenger service. The freight and local passenger locomotives are similar throughout except in the gear ratio, which is so adjusted as to give for the former a maximum speed of 40 miles an hour and for the latter one of 53 miles an hour. These locomotives are of the 0-4-4-0 type and weigh 59 long tons each. The weight is evenly distributed on the axles and comes just within the limit weight per axle of 15 metric tons enforced on the Japanese Government Railways. The aim which it has been sought to attain in the construction of the mechanical parts is to provide a sound and robust locomotive well-proportioned and of excellent finish, and generally to ensure that throughout the locomotives should represent the best British engineering practice. The locomotive trucks are articulated so that drawing and buffing stresses do not go through the superstructure. The monitor and part of the sides can be readily removed to allow erection and dismantling of motor generator sets and compressors, etc.

Each locomotive is equipped with four motors each of 306 hp. arranged in groups of two in permanent series. The control is the "English Electric" electrically operated camshaft type, which provides series and parallel control and also two field shunting notches. The control is arranged for multiple unit operation so that two or more locomotives can, if necessary, be operated from one driving point.

The control voltage is 120 volts which is obtained by means of the motor generator set and this set also drives the fans employed in the forced ventilation of the motors.

The pantographs are raised by air and are so arranged that any one of them can be raised or lowered independently of the others and that all the pantographs on a train can be raised or lowered simultaneously from any driving point. The locomotives are arranged with a driver's cab at each end and the center portion of the superstructure is occupied by the control equipment, air compressors and main resistances. All the high tension apparatus is in closed compartments and suitable interlocking is provided so that these compartments cannot be opened without the high tension apparatus being disconnected from the line. The locomotives are equipped with Westinghouse straight and automatic air brakes.

The eight express passenger locomotives are of the 4-6-6-4 type. The superstructure is mounted on two articulated trucks each with a swivelling bogie and three driving axles. The locomotive weighs 96 long tons, there being 12 tons on each driving axle and 12 tons on each swivelling bogie. The electrical equipment includes 6 motors each of 306 hp., the same motor being used as on the freight and local passenger locomotives. These motors are also arranged in groups of two in permanent series. In other details the equipment of these express locomotives is also similar to that of the type already described.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1923
Jul. Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sep Oct. Nov. Dec. Jan. Feb. Mar. Apr. May Jun.
LOCOMOTIVES HELD FOR REPAIRS REQUIRING OVER 24 HOURS
LOCOMOTIVES TURNED OUT OF SHOP
NUMBER OF SERVICEABLE LOCOMOTIVES STORED
Per Cent
The per cent scale refers primarily to locomotives held for repairs requiring over 24 hours. It is charted on basis of total of 66,500 locomotives on line. The actual number of locomotives on line on May 1, 1923 was 64,390 which number has changed little over period charted.

Marked Improvement Shown in Locomotive Repair Situation

On May 1 the number of locomotives held for repairs requiring over 24 hours totaled 12,473 or 19.4 per cent of the total; this is the lowest percentage reported since last July before the effects of the shopmen's strike were felt. The roads are now storing serviceable locomotives; the number so stored on May 1 was 1,326. The total number of serviceable locomotives on May 1, 50,259, was the largest reported for an extended period.

Fuel Association Holds Well Attended Meeting

Address of Julius Kruttschnitt Feature of Opening Session of Annual Convention at Cleveland

In his address before the first session of the fifteenth annual convention of the International Railway Fuel Association, Julius Kruttschnitt, chairman, executive committee, Southern Pacific, presented a comprehensive survey of the possibilities for economy in the use of railway fuel and outlined quantitatively the directions in which future developments looking toward reductions in fuel consumption are most likely to meet with success. His address, an abstract of which appears elsewhere in this issue, also showed that the officers and men who have to do directly with the consumption of fuel are not alone responsible for reductions in the amount used, but that this responsibility must be shared by every department, including the executive.

President Clark's Address

The convention was held at the Hotel Winton, Cleveland, Ohio, with many members in attendance, J. N. Clark (Southern Pacific) presiding. In his address President Clark called to the members' attention the immediate task that the railroads are facing in the handling of what seems likely to be a record breaking traffic, and said that it is their part to see that the strain of this performance results in no loss of fuel economy. That the work of the association may be of fullest benefit toward this end, he urged the members to work hard while at the convention so that everyone will leave with new inspiration as well as new knowledge with which more effectively to serve the railroads. Mr. Clark expressed his appreciation of the whole-hearted response of railway executives to his requests that they have representatives at the convention.

The report of J. G. Crawford, secretary-treasurer, gave the membership at the end of 1922 as 976 and showed a balance on hand on February 15, 1923, with all bills paid, of $500.

The association was also addressed by T. K. Maher, president, The Maher Collieries Company, Cleveland, Ohio and H. M. Griggs, manager, Ore and Coal Exchange, Cleveland, Ohio. Mr. Griggs outlined the work of the exchange, which serves as a clearing house of advance information relative to the exchange of lake and rail traffic in coal and ore, and presented data showing a volume of lake and rail movement through Lake Erie ports during the seven months' navigation season, that requires the dumping of an average of 3,000 cars of coal daily and 5,000 empty cars a day for ore loading.

The following are abstracts of the reports and papers discussed during the early sessions:

The Extension of Locomotive Runs

By C. B. Peck
Western Mechanical Editor, *Railway Age*

The railroads of North America have passed through much the same characteristic periods in their development that have been experienced in the development of the country itself. There was first the period of rapid extension of cheaply constructed lines into new territory offering a meagre traffic. Then, after the development of the country, there came a period of rebuilding and revising, during which vast amounts of capital were applied to the fixed property to increase its capacity and reduce the cost of operation. Overlapping this period, was one of rolling stock development in which car and locomotive unit capacity grew by leaps and bounds.

The marked decrease in the cost of transportation which took place during these periods, was almost entirely owing to capital expenditures. The results were so large that they left little reason for the development of refinement in the utilization of existing facilities. The first change from this era came with the growing attention to the more intensive development of the locomotive, which has given us the arch, superheater, stoker, feed water heater, syphon and booster.

In all these periods the chief interest has been in providing a modern plant. Its operation continued along traditional lines with no pronounced changes. But the end of federal control marked the beginning of a period of changes in operating practices, all aimed at increasing capacity and decreasing costs, with the expenditure of as little capital as possible.

An interesting revision of practice now well advanced in development, is the running of locomotives over two or more operating districts. The operation of passenger locomotives over more than one freight district is not new. There are many cases where both locomotives and crews have passed through at least one freight division point for twenty years or more. In a few cases passenger locomotives have been operated through two intermediate terminals with a change of crews for more than ten years. But within the last two or three years the inauguration of much longer locomotive runs, notably on the Missouri, Kansas & Texas, with its 678 mile run in oil burning territory, the Union Pacific, with runs from 484 miles to 564 miles in length in coal burning territory, and more recently, the Chicago, Burlington & Quincy, with a run of 483 miles, also in coal burning territory, has broadened the possibilities of this practice and the subject is being studied with the keenest interest by both operating and mechanical department officers the country over.

In discussing this subject it is not my purpose to go into details as to the places where locomotive runs have recently been extended, but to suggest the limitations of this practice, the extent to which the wide variations in operating conditions are likely to affect results, the relation of long runs to the development of the locomotive and the service and maintenance facilities with which it must co-ordinate.

Increased Utilization

The most obvious advantage of longer locomotive runs is the saving in the number of locomotives required to produce a given number of train miles. As with most other railroad facilities, it is difficult to calculate the effect of this saving in motive power in terms of dollars and cents because the ability to increase revenue with the facilities available and the better public relations resulting from increased service, may be of greater importance than the theoretical saving in carrying charges. In this as in the case of most

devices for increasing efficiency and economy, the greatest value may be found in the increase in potential capacity.

The extent of the decrease in the number of locomotives required to produce a given train mileage that may be made by increasing the length of the runs depends to a considerable extent on the time card in the territory affected. For instance, in passenger service, if the trains are well spaced in both directions it is easily possible, operating the locomotives in a pool, to make 200 miles a day on a 100-mile district or even 300 miles a day if a large number of trains are operated. On the other hand, where passenger trains are operated in fleets, which is the case on a number of western lines, if the bulk of the trains from both directions arrive at the terminal of a long locomotive run at approximately the same time, a 24-hour layover may be necessary and the possibility for saving in the number of locomotives assigned to the service materially reduced. There is, therefore, not likely to be any close relationship between the length of the locomotive run and the average daily mileage of the locomotives assigned to the service.

I have in mind a case in which passenger locomotives are operating over four districts, running through three intermediate terminals. The trains are so spaced that each locomotive makes a complete round trip in 48 hours with a short layover at one end and a long layover at the other giving ample opportunity for running repairs and boiler washing. For considerable periods these locomotives can make close to 500 miles a day. But with the additional power which must be assigned to the service to provide for occasional detentions for heavy running repairs and trips to the back shop, as well as to protect against possible engine failures, these long runs have affected a saving in the number of locomotives assigned of only about 40 per cent as compared with the number required to operate the service when engine runs were confined to the freight districts. This, I believe, marks about the limit of increased utilization that will be obtained from long runs, and savings of from 20 to 30 per cent, are likely to be more common. In freight service, with its less regularity of dispatching, more protection will be required and the saving in power effected by long runs correspondingly reduced.

So far as the effect of the length of the run on the utilization of the locomotive is concerned, it seems doubtful whether runs much longer than some of those now in effect will produce any marked increase in the average daily mileage of the assignment of power required for the service. Runs which keep the locomotive in continuous service for 15 to 16 hours provide an opportunity under the most favorable circumstances to make a complete run every 24 hours with a layover averaging eight or nine hours after each trip. A layover of less than eight hours after so long a period of service would be impracticable except for a few trips at a time. It would therefore require an arrangement of runs that would include a long layover of approximately 24 hours, unless the number of trains is exceptionally large, which would result in a loss rather than a gain in the average daily mileage of assigned power for runs much greater than 16 hours' duration. Such runs are roughly equivalent to four or five operating districts of 100 to 125 miles in passenger service and two such districts in scheduled freight service.

Decrease in Operating Expenses

But the saving of locomotives is far from being the most important advantage of the regular practice of running locomotives through terminals. So far as the utilization of the locomotive is concerned, the results could be obtained by operating the long runs only during heavy traffic movement and discontinuing them while business was light. What makes the long run most attractive is the saving effected by keeping the locomotives out of intermediate terminals.

Very attractive savings have been effected in enginehouse expense, running repairs and fuel. Every time a locomotive runs by a terminal, from 1,600 to 1,800 lb. of fuel required to fire up is saved, along with from 100 to 300 lb. of coal an hour for every hour standing under steam.

The aggregate saving is proportional to the number of turns which are discontinued. No real economy in enginehouse expense or running repairs can be effected by running a few locomotives through here and there a terminal, and that to calculate the saving in enginehouse expense or running repairs on the basis of the average cost per engine handled is likely to be exceedingly misleading. To discontinue the turning of a few passenger engines at a terminal, if they happen to be scattered over the three shifts, may relieve the peak requirement so little that no reduction in the force is possible. In such a case, the only saving effected is the material which would have been used in conditioning and repairing the locomotives which were run through. But where enough locomotive turns are abandoned at a single terminal to permit a proportionate reduction in the force, these two accounts offer an opportunity for a joint saving which may be several times greater than can be effected in the fuel used. At one terminal where the handling of 39 engines a day had been discontinued the following saving has been effected:

Saving in maintenance of engine, material and labor	$7,246
Reduction in enginehouse expense, labor, material and supplies	4,221
Fuel for locomotives	3,317
Total	$14,784

This is an average of approximately $12 for each locomotive run through. At another terminal where the handling of six locomotives was discontinued by the extension of the runs, a saving of approximately $900 a month was effected in fuel and enginehouse expense alone. In this case the average saving amounted to $5 for each locomotive run through the terminal. On this railroad it has been found that about 83 per cent of the total savings in enginehouse expense and running repairs is net, the 17 per cent of the gross saving being accounted for by increases in the forces which the long runs have made necessary at other points.

Effect of Long Runs on Maintenance

This result throws an interesting sidelight on the effect long locomotive runs are likely to have on the cost of maintenance. There are considerable differences of opinion on this subject among railroad officers who have had experience with long runs. The belief has been expressed that a considerable part of the cost of classified repairs of locomotives relieved from service by the long runs, will be saved. This opinion is based on the theory that an appreciable portion of the cost of maintenance is incurred through the action of "time and the elements," and that it will accrue whether a locomotive is in service or not. On this basis, if longer locomotive runs effect a reduction in the number of locomotives, the total cost of classified repairs should be reduced and hence the cost per unit of service lowered. On the other hand, it is argued that a material increase in the time during which a locomotive renders continuous service will lead to an increase in the rate of deterioration, particularly with respect to the running gear, which will result in decreasing the total mileage between classified repairs.

At present there seems to be little data available as to just what effect a material increase in the length of runs will have on the mileage life. So far as running repairs are concerned, however, it is evident that a real saving is possible, because experience indicates that if any additional maintenance work is required at the end of a long run of 400 to 500 miles in passenger service and runs of half that length in freight service, it can be handled well within the capacity of present forces, or at least with a small increase.

Another saving which long freight runs occasionally may

effect is a reduction of crew overtime, through the elimination of terminal time allowed for taking the engine from and returning it to the engine terminal. This, of course, is effective only in that it adds one-half hour to the road time of each crew in and out of a terminal before overtime begins and does not apply when runs are made within straight time hours.

Incidental Advantages of Long Runs

Long passenger runs have also been a great convenience at intermediate terminals handling freight power. When business is rushing and engine terminal facilities are worked to capacity the relief from having to care for passenger locomotives has been of assistance in smoothly handling the freight business.

Some of the Obstacles

The advantages of long runs have not been attained without overcoming some difficulties. Where coal is the fuel used, keeping a clean fire is likely to require the greatest attention of any new conditions encountered. A fireman who is accustomed to leaving his engine at the cinder pit at the end of his run is not likely to give the same attention to the condition of his fire approaching the terminal as he does earlier in the trip. But when the engine is to continue in service with another crew this tendency toward neglect cannot be tolerated. In most cases it has been necessary to administer considerable discipline in correcting this habit, but it has generally not taken long to demonstrate that a single operating district does not mark the life of a fire and when this fact has been established, the mutual interest and the dependence of the crews one on the other, automatically insures an honest effort to bring the locomotives into intermediate terminals with good fires.

The Union Pacific has been notably successful in running passenger power over distances of 500 miles without cleaning fires, but this road is especially fortunate in using a coal which is not high in ash and does not tend to clinker. In other cases long runs are made successfully with a less favorable fuel, which occasionally makes it necessary to clean fires at intermediate terminals. In passenger service this must generally be done on the main line. In freight service the locomotive may be run over the ash pit while the train is being inspected.

Cleaning the fire en route may lead to a passenger train delay of 10 to 20 minutes, depending on the time allowed by the schedule at the division point and the condition of the fire. If the available fuel is such that a clean fire cannot be maintained consistently, day in and day out, beyond the length of one or two freight districts, this condition will probably limit the length of passenger runs where the schedules do not permit this time to be made up elsewhere or where other trains are likely to be delayed.

Even though occasional delays may be assumed, it must not be overlooked that a poor quality of coal may materially reduce the net saving in fuel obtainable by running power through terminals. The lower average condition of the fire over the long run, even though a steam failure may not result, may so increase the amount of fuel burned on the road, as to more than offset the reduced terminal consumption.

Lubrication requires some readjustment but has offered no serious difficulty. Where lubricators and rod cups require refilling at intermediate terminals, this is taken care of by employees of the car department if the roundhouse is not conveniently close to the station. This work is done regularly without causing serious delays to train departures and is not a real obstacle to successfully running locomotives over any number of districts which may otherwise be practicable.

There are passenger runs so long that one tank of coal will not take the train through. As there are usually no facilities for taking coal on the main line at division points, it is necessary to arrange for taking coal at some convenient point between terminals. If a fire requires cleaning en route, it may be possible to effect some saving by having it done at one of these coaling stations, thus utilizing the time of the coal chute operator in disposing of the ashes.

Two things stand out clearly in the experience with long engine runs so far attained. One is that, mechanically, the locomotive is much more reliable than has generally been supposed. It is regularly performing 16 hours of continuous service with apparently no more dangerous wear and tear than is evidenced after much shorter trips. The other is that the boiler is much less sensitive than has been supposed. The mixing of treated water with untreated water or a change from a bad water district to a good water district has been considered as almost beyond the bounds of possibility, but this has been done in establishing long runs without causing more than temporary trouble. Where water tends to cause foaming, it has been found necessary to arrange for blowing down heavily en route in order to keep the degree of concentration below the danger point. In such cases it may be that some extra washing out will be required where a change of water used to suffice. This will depend on how closely the extended run coincides with the mileage permitted between washouts.

Assigned Crews and Long Runs

It has long been the belief of many mechanical department officers that a general policy of assigning locomotives to regular crews will result in a higher average mileage performance with less maintenance cost per unit of service than will the practice of pooling. Although pooling is now quite general, there are some roads that still adhere to assignment in both freight and passenger service. At least one such road is obtaining an enviable mileage per locomotive per year. On these roads the long locomotive runs, requiring changing of crews en route and more or less complete pooling of power, unless circumstances are exceptionally favorable, are not likely to appear attractive.

The personal interest which crews take in assigned engines is a factor in extending the mileage between detentions in the enginehouse or trips to the back shop, and while the miles per day of the locomotives actually in service may not be as great as can be obtained from pooled power, the miles per locomotive owned tell a different story, because each locomotive is less frequently out of service than when operating in a pool.

Where low maintenance costs and high mileage are obtained with regularly assigned locomotives it may be seriously questioned whether a long run of two or more districts would insure any saving. The chances of the increasing cost of maintenance eating up the reduction in enginehouse expense would be great.

But the traffic conditions on different roads vary widely. Some may have a comparatively uniform volume of business throughout the year with seasonal variations such that the freight train mileage required during the lightest month may be 75 per cent or even more, of the mileage made during the heaviest month. Such roads are most favorably situated to make a success of regularly assigned engines and crews.

There are roads, on the other hand, with seasonal fluctuations so great that the freight train mileage in the month of lightest traffic may be considerably less than half of that during the heaviest month. In the latter case the attempt to maintain a regular assignment during the peak period will mean a big increase in the amount of power required. It is not impracticable to run locomotives, which at the outset are in first-class condition, for two or three months with almost no regular maintenance attention. Then, when the rush has subsided the average condition of the power can be restored.

It must be admitted, therefore, that there are conditions

which make pooling, at least part of the time, the only practicable course if a high average mileage is to be obtained from each locomotive owned. Where pooling is the practice or where a low average mileage performance with assigned engines suggests that it ought to be, long locomotive runs offer a great advantage both as to utilization and decreased expense.

Long Runs Suggest Systematized Running Repairs

With the decrease in the responsibility of the crews with respect to the condition of the power under pooling, enginehouse forces have gradually come to depend on themselves almost entirely as to determining what attention is necessary at terminals. While no serious difficulty has been caused by long runs, it cannot be denied that there is less margin of safety with respect to engine failures when locomotives are regularly kept in continuous service 16 hours than when there is an opportunity to give them attention after from 3 to 8 hours on the road. The ability to reduce mechanical forces at intermediate terminals, where engines are no longer handled, with no corresponding increase at the others, suggests one of two things. Either it has been the practice to do more work on the locomotive than is really needed, or the lack of uniformity in the amount of work demanded has made it impossible to get full output from the men who must be at hand to protect maximum requirements. The latter is probably much nearer the truth. It would seem, then, that the concentration of more work at fewer terminals has made it possible to more effectively utilize the time of the men employed.

It has been found that the locomotive is good for much longer continuous service than was dreamed of a few years ago. Why not go further and find out just how often the various details ordinarily looked after in the enginehouse, really demand attention? With the information which such a study would furnish, would it not be possible to systematize most of the running repair work on a mileage or time basis, just as boiler washouts and the boiler details specified by Federal regulations are now systematized? Would not such a system reduce to a minimum the emergency character of roundhouse work and give the foreman more effective control of his payroll?

Future Developments

One of the most interesting questions arising from the demonstrated practicability and economic advantages of longer locomotive runs is the effect on the trend of future developments.

In the first place provision should be made for greater lubricator and rod cup capacity so that the attention now required at intermediate terminals will no longer be required.

In coal burning service, maintaining a good fire seems to be the most difficult condition to control of any created by the long run. Has it ever occurred to you that, with all of the attention which has been given to combustion, the locomotive grate is no better today than it was in the first locomotive built? In stationary practice fire cleaning is no longer necessary. It is true that the locomotive boiler presents a more difficult grate problem than the stationary power plant, because of limitations of space in which to work, but are not the possibilities enough to warrant more serious consideration than the subject has received?

One of the possibilities presented by the adoption of longer engine runs is the conservation of capital required to provide a high standard of engine terminal facilities. Or, putting it in another way, with whatever capital it has available, a road can effect more adequate improvements at a few important terminals, than if it is required to spread its appropriations out to cover additional stalls, machine tools, ash pit facilities, etc., at a lot of poorly equipped intermediate terminals. The concentration of improvements at the more important points will bring a bigger return on the investment by making possible a higher degree of labor efficiency at these points.

The roadside facilities may come in for some revision. If the opportunity exists for real savings from longer locomotive runs, eventually, the location of water tanks, coaling stations and even main line fire cleaning facilities will be adapted to the requirements of the long runs. In most cases, however, it is probable that few adjustments of this kind will be required.

Conclusion

The consideration of primary importance is not so much the attainment of the longest run that the locomotive will stand, as it is the highest number of miles per day per locomotive owned with the least expenditure for repairs, enginehouse expense and fuel. The newly established capacity of the locomotive to withstand long periods of continuous service is at the disposal of the railroads. The practical extent of its use to attain these ends depends on such local conditions as character of grade, the kind and volume of traffic and the character and location of terminals. There are few roads that cannot effect real saving somewhere on their lines by increasing the length of their locomotive runs beyond the limits of a single operating district.

Discussion

The discussion brought out references to long locomotive runs on a large number of roads. On oil burning roads the practice of running from 200 to 300 miles in freight service is of long standing. Some cases were cited in which similar runs in coal burning service have become established even with coal exceptionally high in ash.

The relation of the long locomotive run in freight service to the make-up of trains to avoid reclassification at intermediate terminals was referred to a number of times and the discussion indicated that without this practice, the extensive adoption of long freight locomotive runs is impossible.

The importance of considering local conditions in planning for long runs was emphasized by several of those who took part in the discussion. Some of these are the availability of water cranes on the main line at terminals, the location of signals with respect to wayside water cranes, where the long run necessitates taking water away from terminals, so that trains will not be stopped unnecessarily at blocks; changes in grade which affect the size of locomotive required, and the character of the engine terminal facilities. One of the benefits which it was suggested longer runs might effect, is a general keying up of the whole organization to have all conditions most favorable to getting trains over the road without delay or failure. With short runs there is a tendency to neglect both the power and other operating conditions, because of the reliance placed in the big margin of safety for the short period of service.

Report of Committee on Boiler Feedwater Heaters

The first part of the report outlined the development and history of feedwater heaters and summarized the various reports on the subject that have been presented to the association since the initial report in 1914.

A very complete questionnaire was sent out by this year's committee and the results of the answers from 18 roads were embodied in tabulated form.

Present Equipment—America

The replies to the questionnaire show the popularity of the feedwater heater to be increasing steadily, and some roads state that all new power will be equipped with the

device. One road says that it eventually expects to have every locomotive having cylinders 20 in. in diameter or over equipped with feedwater heaters.

Some state that they see little increase in capacity of heater-equipped power, but the majority point out that the increased capacity is dissipated in increased speed. It has been found that engineers who are accustomed to working their locomotives by sound run with a longer cut-off due to some of the exhaust being taken by the heater, thus reducing the sound and causing the engineer to think he was not getting the same amount of work out of the locomotive. This, of course, counteracts some of the saving effected by the heater, but longer experience and greater familiarity will naturally overcome such conditions.

It has been found in some cases, either due to working the locomotive harder or the presence of oil in the water, that on long runs the locomotive equipped with the feedwater heater has a tendency to foam badly toward the end of the run. It was naturally expected that with less water being drawn from outside sources the reverse would be true.

One road has eliminated the oil separator and has made a feedwater heater of 5,400 gallons capacity the standard, with the view that the maximum capacity of the locomotive is required so seldom that the injector should take care of the short periods which the larger locomotives are worked beyond the capacity of their heater.

A check of locomotives built since March 1, 1922, and now on order, brings out the interesting fact that practically one-third of the whole number are equipped with feedwater heaters. Of the 1,724 heaters ordered since 1920, 1,429 were ordered during the year ending May 1, 1923.

Two roads are reported to have been trying heaters not so widely known, one, a waste gas type, known as the Foster-Thompson heater, and the other a locally designed waste steam type known as the Skinner feedwater heater. Both roads report that they have no test data or performance that can be published at this time.

Present Equipment—Foreign

The past year has brought to light several interesting developments in locomotive feedwater heating abroad. What is probably the most practical form of gas type heater so far constructed, was recently applied to a locomotive of the Austrian Federal Railways. This is the invention of J. Rihosek, mechanical engineer, Vienna, and is designed so that it may be removed from the smoke box and replaced as a unit and thus conveniently cleaned inside and outside.

In an article recently contributed to a foreign publication, the author states that tests of this heater have supplied valuable data regarding the amount of heat that can thus be reclaimed from the waste gases.

Rihosek, however, calls attention to the fact that heaters of the exhaust steam and waste gas type may be combined in series whenever the weight of the locomotive permits such an arrangement. In this case, it is stated that cold water from the tender would first be heated by exhaust steam to a temperature of about 190 deg. F. and subsequently, in a waste gas heater to temperatures ranging from 265 to 300 deg. F. It is pointed out, moreover, that the added economy resulting from elevating the feedwater to temperatures considerably above that of exhaust steam is not the only advantage of this arrangement since the boiler scale forming impurities will be partly deposited in the heater, owing to the higher temperatures to which the second stage of the apparatus is subjected.

Another significant development is the introduction of the open type of heater abroad. In place of the Knorr apparatus which has been exclusively used in Germany, Austria and Hungary, a pump of the Worthington type has recently been adopted for new motive power on the Hungarian State Railways. It would appear from the illustrations of this equipment, however, that after being discharged from the open type heater, the feedwater is passed through a closed type heater before entering the boiler. The open type apparatus used on these locomotives is manufactured in Budapest. This is positioned on the left side of the locomotive and the closed type heater which is used in series, comprises a drum located underneath the smoke box. The locomotives to which this equipment is applied are also provided with feedwater purifiers of the Pecz-Rejto type mounted on top of the boiler barrel.

Since the effect of feedwater heating is to increase the rate of evaporation in the boiler, it follows that any tendency toward foaming occasioned by chemical impurities in the water will be enhanced by feedwater heating. Water purifiers are already being tried in some foreign countries and it is believed that their possibilities are such that investigation should be made and reported to the association. It is suggested, therefore, that the subject of water purification by means of apparatus supplementary to the feedwater heater might properly be studied by your committee during the coming year, since it appears that the possibilities of this means of water purification have never been fully investigated.

The Exhaust Steam Injector

The exhaust steam injector, which the committee has been requested to investigate, is yet in its development stage in this country. From the information available, it seems that there is not quite as great a range with the exhaust steam injector as with the live steam injector. The range is, however, sufficiently great to meet the requirements of the average service of American locomotives. This device is extensively used in Europe, there being at this time in the neighborhood of 6,000 exhaust steam injectors actually in service.

A report from an English road states that they have 515 exhaust injectors of the Davies and Metcalfe type, operating in both passenger and freight service. The locomotives and trains are not as heavy, however, as the general average in this country, but since the performance of the device is considered quite satisfactory it seems reasonable to expect that improvements will shortly be made which will render it adaptable to heavier service. The particular road mentioned states that all new power purchased is being equipped with exhaust steam injectors.

The type of oil separator used with the Davies and Metcalfe exhaust steam injector is the same as that used on the Elesco in this country.

It is difficult to calculate accurately the coal and water saving of the exhaust steam injector, because these vary largely with the amount of water delivered. Under conditions of high back pressure, such as are met with when the engine is working at maximum capacity, the exhaust injector will feed the boiler without the use of any live steam whatever. When the engine is working at low rating, the live steam used runs up as high as 2½ per cent of the weight of water delivered to the boiler.

The temperature of the water delivered to the boiler is highest when the injector is working at its minimum rating, but the heat recovery is greatest when the injector is working at maximum capacity.

Tests made in this country have shown coal savings around 10 per cent to 15 per cent. The best results, of course, are obtained when the exhaust injector is kept continually at work from one end of the line to the other. Starting and stopping the injector not only results in the loss of some water in priming, but no exhaust steam is saved when the injector is not working.

Summary

A summary of trials and experiments of various roads with various kinds of feedwater heaters brings out the following basic principles which should govern heaters as ap-

plied to locomotives in order to realize their maximum benefit:

1. The boiler feedwater shall be heated from a source of heat that would otherwise have been wasted.
2. The apparatus shall present the greatest possible simplicity of construction with the smallest possible number of wearing parts. It shall occupy as little space as possible and be of the minimum weight.
3. The feedwater heaters should give a continuous and certain supply of hot water, the temperature of which will increase with an increase of the pressure of the exhaust steam or the temperature of the front end gases.
4. Arrangements shall be provided for separating any lubricating oil from either the steam or the water of condensation and the lubricating oil allowed to enter the boiler shall be reduced to a minimum.
5. Hot gas heaters or economizers should be arranged to present the minimum interference with the passage of the gases from the boiler flues to the stack, and should also be so constructed as to be quickly and easily removed and replaced. They should have the minimum of separable joints within the front end.

The members of the committee were E. E. Chapman (A. T. & S. F.), chairman; E. A. Averill (Superheater Company); H. A. Macbeth (N. Y. C. & St. L.); J. A. Carney (C. B. & Q.); Geo. S. Mikles (N. Y. O. & W.); G. N. Gresley (London & North Eastern); Geo. E. Murray (G. T.); J. M. Lammedee (Worthington Pump & Machinery Corp.); L. G. Plant (Railway Review); W. A. Larick (N. Y. C.); Prof. J. M. Snodgrass (University of Illinois); L. P. Michael (C. & N. W.), and G. Von Boden (S. P.).

Discussion

H. B. Oatley (Superheater Company) presented a written discussion in which he estimated a fuel saving of $1,000 a year for the feedwater heater on the basis of a locomotive burning $10,000 worth of coal a year. From this should be deducted $150 for investment charges. The only debatable question, he stated, is how much of the remaining $850 will be required for additional maintenance. The only solution of this question is experience based on a large enough number of heaters in service at one place to permit this work to be regularly organized. He stated that variations in local conditions were such that the experience of one road would not answer the question for another.

The only case cited in which maintenance has been excessive was on the Central Vermont, where, in spite of the fuel saving effected, the heaters have been removed because of excessive terminal attention. E. A. Averill (Superheater Company) gave the results of a study of work reports on 334 arrivals of feedwater heater locomotives over a period of one month at one terminal, after the heaters had been in use from five to six months. Eighty per cent of the work reports contained no reference to the heaters, 95 per cent showed no work that would require over 15 min., and the remaining five per cent called for inspection or work of indeterminate amount. The record was perfect as to failures chargeable to the feedwater heaters.

On the Southern Pacific some trouble has been experienced from hot water leaking into the low pressure pump cylinder when the heater is not working, thus causing the suction to break when the heater is started. To avoid this trouble it has been found best to start the heater pump at the same time as, or a little before the locomotive, and to work it continuously while the locomotive is working. Engines with feedwater heaters on the Southern Pacific have been found to steam so freely that the exhaust nozzles have been increased in size.

There was some disagreement as to the tendency of enginemen to depend on the sound of the exhaust as a guide to working the locomotive. The prevailing opinion, however, was to the effect that this practice does have a tendency to cause heater-equipped locomotives to be overworked, and that this requires supervision and education before it can be corrected. A number of cases were reported in which the feedwater heater apparently causes the locomotive to run lame, because of an unequal draft of exhaust steam from the two sides of the engine. This, however, has been found to be apparent only, as the work of the locomotive does not seem to be affected.

Report of Committee on Fuel Stations

All modern installations are of the overhead storage, self-clearing type and usually with sufficient capacity to receive and store in eight hours the demands for at least 24 hours. Reinforced concrete is the generally accepted material used in the construction of the building itself. Drop spouts are universally used. The housing and details of the actual coal handling mechanism vary with the type and arrangement selected.

In 1914, the committee, after an analysis of the requirements to be met by the coal chute, suggested that the overhead hopper chute of three types would meet any situation. These types were: Gravity chute, with cars elevated by locomotive or stationary power; balanced bucket, in which the coal is dumped into a pit and raised by balanced buckets, and bucket conveyor, with the coal dumped into a pit and raised by a series of small buckets.

From the fact that lump and run of mine coal was generally furnished for locomotive coal, breaker bars were called for. Since that time, however, there has been a considerable change in the practice of purchasing coal. In a great many instances the coal is ready for immediate use on the locomotive. Such a practice naturally will permit the elimination of the breaker bars with their many objectionable features.

From the experience with storage bins designed primarily for capacity rather than for the quality of the discharged coal, the committee recommended that all receptacles for coal should be designed so as to avoid the probability of any clogging in the corners, suggesting that warped surfaces, especially at the openings, be given consideration. Another point made which has been subsequently stressed is the necessity for maintaining the point of delivery of the coal to the bin directly above the opening of the discharge of the fuel to the engine tank.

With easily fractured or powdered coal, deflectors should be used. They should be carefully arranged, however, and checked to see that they are not the cause of the coal clogging.

The suggestion was made that the slope of all bin flooring could probably be from 35 to 45 deg., to best serve the situation. Subsequent developments, however, show that in many cases, due to the grade and kind of coal handled, this angle should, in some cases, be as great as 55 deg.

Recognizing the desirability of some device to measure the coal delivered to the engine, either by weight or bulk, the committee was not in position to recommend any definite plan or arrangement. In 1916 a report was made with illustrations of some of the arrangements in use to accomplish this measuring of the delivered fuel. There have been comparatively few such installations made, however.

The value of mechanically operated chutes is evidently being impressed upon all railroads using coal as locomotive fuel. In some instances, they are replacing comparatively modern gravity chutes, primarily because of the large reduction in the cost per ton of handling the coal from the car to the tender. As an example, an old style shovel chute through which about 16,000 tons of coal were handled per month, was replaced by a mechanical chute with an immediate reduction

in the cost per ton for handling of 21 cents. Such a reduction would pay handsomely for the improvements made.

From the experience gained with the large capacity coal stations, a demand now exists for a mechanical coaling plant of small capacity, even as low as 50 tons capacity. Examples of such installations are given from time to time in the railroad papers, and no doubt are familiar to all.

At the 1922 convention the committee was requested to develop the method by which a reduction of 13.4 cents per ton was made by the Chicago Great Western in the cost of handling coal at its mechanically operated coaling stations between September, 1920, and December, 1920. It was found that this was accomplished by closer supervision, reduction of the force, and purchasing sized coal which did not require breaking before it could be elevated.

The following were members of the committee: W. E. Dunham, C. & N. W., Chairman; E. E. Barrett, Roberts & Schaefer Co.; C. F. Bledsoe, Ogle Construction Co.; W. S. Burnett; J. C. Flanagan, Fairbanks-Morse Co.; J. W. Hardy, West Kentucky Coal Co.; L. J. Joffray, I. C.; W. T. Krausch, C. B. & Q.; A. A. Meister, S. P.; J. C. Nellegar, Link Belt Co.; H. D. Savage, Combustion Engineering Co.; T. W. Snow, T. W. Snow Construction Co., and E. J. Summers, C. M. & St. P.

Discussion

In the absence of the chairman, W. E. Dunham (C. & N. W.), the report was presented by L. J. Joffray (I. C.). The need for a weighing device, if individual fuel records are to be of any value, was repeatedly brought up in the discussion. A few cases were mentioned where such devices are still in operation at coaling stations, notably the Canadian National and the Chicago Great Western. On the latter road, it was stated that with one exception every coaling station was so equipped. In the opinion of several members, however, the use of such devices at coaling stations is not likely to be effective as a means of checking up the performance of engine crews and getting their support, because they are still charged with the coal burned at terminals for which they are not responsible. It was suggested that what is needed is some simple means of quickly determining the amount of coal actually burned on the road. The use of measuring pockets as a substitute for scales has not yet met with success. One reason for this is the wide variation in weight of a given volume of coal that may result from a difference in the size.

There was considerable difference of opinion as to whether the lowest cost of delivering coal could be obtained with the mechanical or the gravity type of station. On some roads it is claimed that the latter type is cheapest to operate, and that it is more reliable, because in case of failure of the winch for elevating cars up the incline, the operation can be continued by using a locomotive. But attention was called to the fact that gravity stations are confined to two tracks, whereas mechanical handling plants may serve more tracks, and that the question of engine delays should be taken into consideration in comparing the two types. In closing, Mr. Joffray said that the most favorable costs for gravity chutes are obtained from large units, but that in small units they are expensive and are obsolete.

A number of instances were cited in which wooden coal chutes have been destroyed by fire as the result of wetting the coal before dumping it into the bins. To overcome this Mr. Joffray advocated the use of a sprinkling arrangement located at the apron, so that the dust can be kept down by wetting the coal as it flows to the tender.

Fuel Saving Aspect of Boiler Water Treatment

By C. R. Knowles
Superintendent, Water Service, Illinois Central

The chief value of boiler water treatment from a fuel saving standpoint is in the prevention of scale formation on the tubes and sheets of boilers, thereby eliminating the loss of fuel resulting from the insulating effect of the scale. Among other fuel losses occurring through the use of poor boiler waters are leaking and foaming as well as poor boiler performance, more frequent knocking of fires and firing up on account of repairs, etc. It is a difficult matter, however, to place a definite value upon the fuel losses from the latter named causes, for while it is readily apparent that leaking, foaming, and other boiler troubles, result in heavy fuel losses, no definite standards have been established by which such losses may be measured except in individual cases.

Scale

While all authorities are not in perfect agreement as to the exact ratio of losses from incrustation, certain definite standards have been established as a basis upon which the fuel loss may be estimated and it is apparent that the most conservative estimates show enormous fuel losses from boiler scale.

The most recent and most widely quoted table of fuel losses for boiler scale was prepared by Prof. Schmidt from the results of experiments at the University of Illinois, as follows:

Character of scale	Thickness, in.	Composition	Per cent loss
Hard	1/50	Mostly carbonate	5.4
Soft	1/32	Mostly carbonate	7.2
Hard	1/32	Mostly carbonate	8.5
Soft	1/25	Mostly carbonate	8.0
Hard	1/25	Mostly sulphate	9.3
Hard	1/20	Mostly sulphate	11.1
Soft	1/16	Mostly sulphate	10.8

Character of Scale	Thickness, in	Composition	Per cent loss
Soft	1/16	Mostly carbonate	11.0
Soft	1/16	Mostly carbonate	12.4
Hard	1/16	Mostly carbonate	12.6
Soft	1/11	Mostly carbonate	15.0
Hard	1/9	Mostly carbonate	15.9

Apparently the chemical composition of the scale has but little effect upon its insulating power as compared with its density or mechanical structure, therefore the difference in opinion as to the heat loss through varying thicknesses of scale would probably be reconciled if the character and density of the various scale formations was taken into consideration.

From the best information available all locomotive boilers in service have at least 1/16 in. of scale half of the time and many have from ⅛ to ¼ in., and it is not at all unusual in hard water districts to find locomotives using untreated water with from ⅜ to ½ in. of scale on the boiler sheets.

A very conservative estimate of the amount of water actually converted into steam by locomotive boilers is 450,000,000,000 gallons per year. Assuming that the water carries only two pounds of scale forming matter per thousand, which is a conservative figure for the country as a whole, it means that 900,000,000 lb. or 450,000 tons of scale forming material is being introduced into our locomotives every year, the greater part of which will adhere to the tubes and sheets unless removed by treatment.

This water is being used by 66,000 locomotives, therefore the scale forming solids represent an average of over 1,350 lb. of scale for each boiler, or sufficient to form more than ⅛ in. of scale on the tubes and sheets of every locomotive in service, and represents from 15 to 20 per cent loss in fuel.

These figures include the solids removed from the water now being treated on railroads amounting to approximately 6½ per cent of the total water used. However, we have only to assume a loss of about 5 per cent of the fuel fired to produce a loss of 16,000,000 tons of coal per year, which, at $4 per ton, represents a loss in money of $64,000,000.

In addition to the water used by locomotives, stationary power plants, heating plants, etc., use approximately 45,000,000 gallons of water per year, and applying the same figures of fuel loss as for locomotives, we have an additional loss from scale deposited in stationary boilers of approximately $6,000,000.

Suspended Matter

Many surface waters, such as those of the Mississippi, Tennessee and other rivers, contain little matter in solution, but carry large quantities of suspended matter, mostly mud or clay. The rivers of the middle west carry an average of about 1½ lb. of suspended matter per thousand gallons throughout the year, and as high as 5 or 6 lb. during certain seasons of high water, southern rivers often exceeding these figures. The chief objection to suspended matter in considerable quantities is the increased tendency to cause foaming and the danger of "mud burns" if it is allowed to accumulate in the boiler.

Removal of suspended matter is usually accomplished by either sedimentation or filtration, or both. As a general thing, where the water is used for boiler purposes, the incrusting solids in the water are sufficient to justify complete treatment as well as filtration. The exceptions are where the waters are very low in incrusting solids, as with some of the southern streams.

Foaming

In addition to destroying the efficiency of the locomotive, foaming causes a direct loss of fuel by reason of the water carried by the steam absorbing heat, which is a total loss. Blowing down boilers to reduce the concentration and lessen the foaming causes heavy fuel losses that are difficult to establish on a fixed basis. A typical example may be quoted where the fuel saving accomplished by reducing the amount of blowing off was over $12 per 1,000 engine miles.

Another fuel loss due directly to foaming of boilers is from the more frequent washing of boilers, which is always necessary when foaming water is used. Approximately 10,000 gallons of water is used in washing and filling the average locomotive. To heat and pump this water against the pressure desired for washing requires about 400 lb. of coal, while the coal lost in knocking fires, emptying boiler, firing up, etc., is at least 600 lb. or a total loss of 1,000 lb. of coal lost each time a locomotive is washed.

Fortunately, foaming waters are not as numerous on our railroads as scale forming waters, therefore, the fuel loss, in the aggregate, is much less, but it is of sufficient importance, from the standpoint of fuel economy alone, to be given very serious consideration.

Treatment

It is, of course, always advisable to develop a natural water supply of satisfactory quality rather than to install a treating plant, but unfortunately this is not always possible except at prohibitive cost. Where facilities are not provided for fully treating the water outside the boiler, the use of a good compound is often advisable and is followed by good results when properly applied. The existing objections to the use of boiler compounds are due largely to their improper application rather than to the failure of the compounds themselves, and they have often been condemned as unsatisfactory when the fault lay in the failure to apply them as instructed.

A properly designed treating plant offers the most satisfactory and economical method of treating boiler waters and the use of compounds should be confined to points where the results to be obtained would not justify the expense of maintaining and operating a treating plant.

The sodium salts in the water after treatment will, if present in considerable quantity, cause trouble from foaming, particularly, in the presence of suspended matter. This condition may be corrected by blowing down boilers or the use of anti-foaming compounds, or both.

Treating Plants in Service

There has been a marked interest in the treatment of railway water supplies, during the past few years, due in part to the greatly increased cost of fuel and boiler repairs and the importance of keeping locomotives in service. The number of water softening plants recently constructed by railroads is an indication that the value of good water for locomotives is receiving more consideration every year. While there is no complete record of the number of water treating plants in railroad service, a fairly accurate estimate would be in the neighborhood of 800 plants. From the known capacity of some 200 plants the average amount treated by each plant is estimated at 40,000,000 gallons per year, or a total of approximately 32,000,000,000 gallons of treated water used annually on railroads.

Approximately 500,000,000,000 gallons of water is converted into steam annually on the railroads of the United States, and from reliable estimates about 50 per cent of the water used is of such quality that treatment would prove economical. Therefore, it would appear that we have only about 13 per cent of the treating plants in service that are needed. It is only necessary to check the reports of results obtained from the operation of water treating plants on the roads having them in service, to be convinced that the fuel saving alone will pay a handsome return on the investment.

Discussion

Following the reading of the paper several written discussions were presented. C. H. Koyle, engineer water service, C. M. & St. P., cited a case which showed the effect of leaking on fuel consumption. In installing treating plants at seven water stations on a 130-mile district, all very hard waters, the first plant was put in at a station pumping from a stream badly contaminated with sewage, which causes excessive boiler leaking. After the plant was in operation the coal consumption per 1,000 gross ton miles dropped 15 per cent, as a result of the freedom from leaking, while it dropped only 8 per cent more after the boilers were free from scale. F. J. Walters (N. Y. C. & St. L.) pointed out that the fuel saving effected by water treatment is permanent, rather than temporary, as some of the other savings in fuel are likely to be, and R. C. Bardwell, engineer water service, C. & O., brought out the need of proper organization to supervise the operation of water softening plants in order that the expected results may be attained.

[An account of the further proceedings of the convention will appear in a later issue.—EDITOR.]

AN ANTI-WASTE DRIVE, throughout all departments in all sections of the country has been started by the Pullman Company. An investigation has disclosed waste in the cleaning and upkeep of cars. If each of the 4,000 cleaners misuses a pound of waste a week, the loss is $25,000 a year and the saving of a bar of soap a week by each employee would amount to $12,500 a year. It was found that there was issued a new sheet and a new towel for every 24 passengers carried last year and that every passenger represented approximately five cents expenditure for supplies or an average of $240 a car. The efficiency plan has been carried into the shops also.

Operating Statistics of Large Steam Roads—Selected Items for the Month of March, 1923,

Region, road and year	Average miles of road operated	Train-miles	Locomotive-miles: Principal and helper	Locomotive-miles: Light	Car-miles: Loaded (thousands)	Car-miles: Per cent loaded	Ton-miles (thousands): Gross, Excluding locomotive and tender	Ton-miles (thousands): Net, Revenue and non-revenue	Average number of locomotives on line daily: Serviceable	Unserviceable	Per cent unserviceable	Stored
New England Region:												
Boston & Albany 1923	394	349,763	373,380	37,823	6,573	71.4	343,841	149,186	117	26	18.2	...
1922	394	261,266	282,418	32,573	4,953	65.7	259,923	102,381	114	28	18.9	...
Boston & Maine 1923	2,455	652,226	723,244	66,584	13,224	74.4	681,204	303,427	335	119	26.2	...
1922	2,455	582,200	650,115	56,388	12,489	68.1	657,197	267,146	320	136	29.7	31
N. Y., New H. & Hartf. 1923	1,974	462,166	498,501	37,709	11,136	73.9	562,246	252,005	285	106	27.0	...
1922	1,977	468,303	514,626	30,700	12,040	68.9	615,767	262,010	286	76	21.0	18
Great Lakes Region:												
Delaware & Hudson 1923	886	394,471	564,131	42,819	9,683	67.7	645,268	347,423	239	55	18.6	5
1922	887	424,693	569,839	44,404	10,734	66.5	733,644	367,065	281	41	12.8	84
Del., Lack. & Western 1923	993	501,516	646,234	112,230	15,156	69.4	868,164	422,133	291	84	22.3	4
1922	994	544,654	682,154	135,032	16,658	70.3	901,633	420,175	297	63	17.5	9
Erie (inc. Chic. & Erie) 1923	2,309	1,225,530	1,426,975	68,705	41,135	69.0	2,446,650	1,187,599	589	176	23.0	...
1922	2,309	988,724	1,132,228	46,513	31,780	64.9	1,917,785	895,249	549	216	28.2	27
Lehigh Valley 1923	1,317	536,066	594,131	66,068	14,875	70.2	889,754	454,436	305	253	45.4	1
1922	1,316	618,517	686,960	74,417	17,657	64.5	1,077,694	504,534	410	132	24.4	99
Michigan Central 1923	1,827	663,438	677,151	24,450	22,501	72.9	1,139,454	491,782	317	83	20.8	8
1922	1,827	539,553	552,895	22,224	16,828	66.1	897,606	362,038	316	94	23.0	71
New York Central 1923	6,469	2,729,474	3,139,575	249,217	94,038	65.5	5,639,170	2,650,222	1,238	498	28.7	33
1922	6,468	2,097,592	2,357,768	143,456	71,385	62.6	4,236,335	1,871,330	1,144	573	33.4	261
New York, Chic. & St. L. 1923	1,225	535,925	548,147	3,809	15,639	72.9	844,943	386,137	162	62	27.7	5
1922	1,225	466,855	470,383	1,507	14,237	69.4	722,078	301,808	177	68	27.7	46
Pere Marquette 1923	2,182	401,236	417,182	8,780	10,555	73.9	568,340	286,977	161	40	19.9	...
1922	2,191	355,032	369,881	6,844	9,424	66.5	532,645	228,065	159	53	24.8	14
Pitts. & Lake Erie 1923	231	204,146	210,375	896	6,646	61.0	501,407	286,740	68	14	17.6	...
1922	228	120,428	124,398	1,108	4,049	59.5	296,799	166,649	62	17	22.2	7
Wabash 1923	2,418	618,260	655,183	8,527	19,207	76.5	968,122	417,998	245	92	27.4	...
1922	2,418	648,154	682,891	8,106	17,594	70.0	952,606	420,514	260	80	23.5	11
Ohio-Indiana-Allegheny Region:												
Baltimore & Ohio 1923	5,212	2,323,069	2,676,884	177,419	61,913	67.8	3,706,607	1,858,178	1,052	252	19.3	28
1922	5,235	1,879,642	2,194,382	141,881	48,742	64.8	3,076,364	1,554,597	932	452	32.7	91
Central R. R. of N. J. 1923	695	323,908	353,347	39,033	7,290	63.4	480,934	245,683	193	77	28.3	...
1922	692	299,641	336,565	44,249	7,168	59.9	476,663	237,831	213	38	15.0	9
Chicago & Eastern Ill. 1923	945	264,304	270,712	4,971	6,816	65.0	411,778	206,160	111	58	34.3	5
1922	945	233,486	234,773	3,763	5,684	63.7	345,754	174,596	117	42	26.2	33
Cleve., Cin., Chic. & St. L. 1923	2,377	759,948	797,105	6,589	24,118	69.0	1,445,284	720,952	306	132	30.2	...
1922	2,387	713,316	751,611	4,334	20,155	59.7	1,279,208	604,647	320	133	29.3	5
Elgin, Joliet & Eastern[1] 1923	460	163,266	184,097	12,944	5,009	68.4	369,169	202,195	85	15	14.9	...
1922	459	125,941	140,690	9,792	3,805	65.6	291,917	153,858	93	16	14.9	24
Long Island 1923	393	51,909	64,371	10,492	673	59.5	39,661	15,676	43	10	18.4	...
1922	394	47,846	52,553	9,155	639	61.3	36,559	14,387	39	7	14.5	1
Pennsylvania System 1923	10,876	5,019,848	5,592,487	463,356	136,094	67.7	8,747,345	4,434,016	2,491	834	25.1	...
1922	10,882	4,515,323	4,955,119	379,025	118,997	63.7	8,004,792	3,982,471	2,577	847	24.7	515
Philadelphia & Reading 1923	1,117	768,740	869,864	99,644	19,810	67.6	1,310,131	715,065	337	80	19.2	29
1922	1,119	648,259	721,084	82,654	15,980	61.7	1,105,224	582,551	351	77	18.0	121
Pocahontas Region:												
Chesapeake & Ohio 1923	2,553	881,629	970,504	19,576	26,461	61.5	2,105,008	1,162,606	413	94	18.6	...
1922	2,548	836,665	933,252	22,184	24,653	56.6	1,932,162	1,045,578	439	114	20.7	34
Norfolk & Western 1923	2,228	897,537	1,158,429	47,149	24,300	64.6	1,824,482	1,007,473	534	166	23.7	41
1922	2,228	864,834	1,049,430	41,070	24,303	57.8	1,890,140	1,014,237	590	110	15.7	184
Southern Region:												
Atlantic Coast Line 1923	4,860	897,328	902,349	14,808	21,418	65.6	1,107,165	441,798	315	79	20.1	...
1922	4,924	729,852	742,609	12,364	17,243	62.5	885,852	323,775	281	103	26.8	20
Central of Georgia 1923	1,907	331,073	334,455	4,440	7,026	76.4	367,125	178,949	116	16	12.4	...
1922	1,899	225,083	227,412	2,936	5,296	76.8	257,004	117,768	114	24	17.6	8
Ill. C. (inc. Y. & M. V.) 1923	6,190	2,184,527	2,201,604	46,345	58,911	66.1	3,599,657	1,664,741	753	99	11.6	3
1922	6,137	1,714,816	1,723,718	35,680	45,273	62.5	2,834,570	1,266,204	751	94	11.1	41
Louisville & Nashville 1923	5,022	1,707,178	1,837,041	65,404	31,219	66.4	1,944,542	966,823	590	121	17.1	...
1922	5,021	1,617,696	1,731,265	67,120	28,715	61.4	1,860,623	898,787	582	96	14.1	11
Seaboard Air Line 1923	3,550	603,111	615,264	9,916	13,269	69.3	697,204	285,094	200	62	23.9	...
1922	3,537	477,013	487,499	9,434	10,661	67.4	555,718	217,267	188	75	28.5	...
Southern Ry. 1923	6,941	1,710,419	1,762,998	46,702	38,088	72.9	1,995,042	913,407	860	188	17.9	2
1922	6,941	1,346,281	1,374,607	33,681	29,489	69.1	1,532,350	650,525	862	188	17.9	23
Northwestern Region:												
Chic. & N. Wn. 1923	8,463	1,808,836	1,877,400	25,310	38,360	66.5	2,157,028	936,874	852	240	22.0	...
1922	8,369	1,569,204	1,620,059	16,468	32,395	63.0	1,846,142	759,134	803	228	22.1	28
Chic., Milw. & St. P. 1923	11,022	1,940,581	2,002,550	80,815	47,949	66.9	2,693,930	1,257,293	851	200	19.0	14
1922	11,027	1,721,877	1,783,714	75,063	40,335	63.1	2,341,164	1,066,519	841	206	19.7	59
Chic., St. P., M. & O. 1923	1,726	369,318	393,008	17,487	6,997	72.2	370,228	166,245	156	52	25.1	2
1922	1,726	327,126	347,531	13,872	6,298	72.4	327,012	141,110	148	63	29.8	22
Great Northern 1923	8,255	1,089,119	1,128,823	57,921	27,926	65.3	1,630,023	754,997	550	223	28.9	11
1922	8,265	785,797	813,952	30,081	20,532	70.4	1,129,136	535,082	575	183	24.2	176
M., St. P. & S. Ste. M. 1923	4,352	584,583	599,206	12,379	13,404	76.8	669,448	330,138	286	58	16.9	4
1922	4,355	485,139	520,389	8,276	10,615	72.6	529,120	244,233	294	57	16.2	27
Northern Pacific 1923	6,422	945,375	991,928	60,866	25,644	65.9	1,488,064	680,091	551	182	24.8	16
1922	6,414	741,951	777,324	49,747	21,416	75.5	1,129,566	549,530	554	156	22.0	78
Oreg.-Wash. R. R. & N. Co. 1923	2,186	217,485	244,079	33,900	5,567	75.0	297,954	140,055	126	49	27.9	...
1922	2,166	192,799	217,036	29,714	4,869	74.7	269,912	132,713	122	38	24.0	2
Central Western Region:												
Atch., Top. & S. Fe 1923	9,870	1,745,305	1,830,310	93,906	46,888	67.8	2,603,167	1,006,050	718	212	22.8	62
1922	9,798	1,386,445	1,453,528	68,111	36,364	67.6	1,982,109	760,525	797	158	16.6	223
Chicago & Alton 1923	1,010	359,988	365,265	6,468	8,020	64.0	477,162	224,530	115	34	22.9	3
1922	1,010	353,421	361,241	6,646	7,322	60.5	464,834	211,672	105	43	28.8	4
Chic., Burl. & Quincy 1923	9,326	1,859,927	1,945,958	91,969	49,315	64.1	2,925,535	1,364,601	776	214	21.6	5
1922	9,326	1,619,200	1,688,778	79,397	42,895	63.1	2,601,518	1,228,925	694	260	27.2	80
Chic., Rock I. & Pacific 1923	7,635	1,422,376	1,451,692	14,632	31,275	71.0	1,640,822	700,558	498	174	25.9	4
1922	7,662	1,305,652	1,324,525	9,932	27,980	67.2	1,510,160	636,972	602	149	19.9	61
Denver & R. G. Wn. 1923	2,593	232,681	291,848	56,495	4,849	71.0	278,470	137,604	229	95	29.4	5
1922	2,593	218,464	269,369	54,320	4,846	66.1	289,512	140,147	227	84	26.9	39
Oreg. Short Line 1923	2,367	351,558	371,181	26,266	8,365	70.3	486,201	225,995	148	85	36.5	19
1922	2,360	344,795	359,772	24,848	8,143	70.9	496,115	249,144	169	57	25.5	29
Southern Pacific 1923	6,923	1,195,241	1,368,245	247,032	36,682	70.1	2,019,014	836,681	594	198	24.9	23
1922	6,925	921,240	1,056,445	187,812	27,046	69.1	1,503,706	629,003	532	204	27.7	37
Union Pacific 1923	3,709	974,602	1,010,624	59,756	30,810	74.4	1,550,228	631,149	378	172	31.2	41
1922	3,665	871,847	883,515	38,352	25,626	73.2	1,357,660	597,566	402	134	25.0	81
Southwestern Region:												
Gulf, Colo. & S. Fe 1923	1,897	236,647	245,030	4,766	5,835	66.7	335,373	150,284	109	34	23.6	17
1922	1,895	200,870	209,568	4,423	5,111	65.2	289,590	122,914	122	27	17.8	34
Missouri, Kansas & Texas. 1923	1,658	266,757	267,342	7,205	7,411	64.9	410,764	170,135	91	86	48.7	7
1922	1,658	204,713	204,713	5,769	5,708	60.7	326,183	129,472	140	43	23.6	73
Mo., Kans. & Tex. of Tex. 1923	1,739	210,307	214,992	5,426	4,022	66.4	226,861	94,500	79	66	45.3	8
1922	1,738	188,145	192,573	2,112	3,754	58.4	224,910	87,410	86	52	37.5	21
Missouri Pacific 1923	7,112	1,025,945	1,034,177	33,311	26,950	75.5	1,446,257	690,087	385	222	36.5	...
1922	7,305	1,085,666	1,094,243	29,856	26,557	68.7	1,507,969	699,231	422	160	27.4	1
St. Louis-San Francisco. 1923	4,683	941,977	954,645	19,334	17,638	68.7	988,267	444,156	355	123	25.8	...
1922	4,683	780,266	789,464	13,019	14,253	66.3	807,638	354,825	345	110	24.1	27
Southern Pacific Lines (in Texas and Louisiana)[2] 1923	3,680	623,709	627,658	5,383	13,956	66.5	810,610	361,199	191	101	34.5	6
1922	3,710	553,894	557,414	4,783	11,449	65.2	663,118	291,095	184	93	33.7	10
Texas & Pacific 1923	1,953	265,465	265,557	4,064	6,432	67.0	353,287	143,212	109	95	46.6	16
1922	1,953	240,777	240,893	2,482	5,438	65.1	300,261	119,864	113	87	43.4	19

[1]No passenger-train service. [2]Includes Galveston, Harrisburg & San Antonio, Houston & Shreveport, Houston & Texas Central, Houston East & West Texas, Iberia & Vermilion, Lake Charles & Northern, Louisiana Western, Morgan's La. & Tex. R. R. & S. S. Co. and Texas & New Orleans.

Compared with March, 1922, for Roads with Annual Operating Revenues above $25,000,000.

Region, road and year	Average number of freight cars on line daily: Home	Foreign	Total	Per cent unserviceable	Stored	Gross tons per train, excluding locomotive and tender	Net tons per train	Net tons per loaded car	Net ton-miles per car-day	Car-miles per car-day	Net ton-miles per mile of road per day	Pounds of Coal per 1,000 gross ton-miles including locomotive and tender	Passenger service: Train-miles	Passenger-train car-miles
New England Region:														
Boston & Albany	1923	1,297	9,381	10,678	2.4	....	983	427	22.7	451	27.8	12,217	223	309,849	1,982,408
	1922	3,535	4,998	8,533	6.0	840	995	392	20.7	387	28.5	8,384	209	306,544	1,957,708
Boston & Maine	1923	11,964	29,574	41,538	9.5	....	1,044	465	22.9	236	13.8	3,987	207	826,136	4,423,464
	1922	16,914	14,763	31,677	18.4	845	1,129	459	21.4	272	18.7	3,510	162	820,056	4,412,369
N. Y., New H. & Hartf.	1923	16,106	39,202	55,308	13.1	....	1,217	545	22.6	147	8.8	4,118	225	1,012,216	6,440,987
	1922	24,211	16,692	40,903	23.6	743	1,315	559	21.8	207	13.8	4,276	165	999,410	6,116,368
Great Lakes Region:															
Delaware & Hudson	1923	7,624	11,865	19,489	6.7	....	1,636	881	35.9	575	23.7	12,644	243	194,002	1,000,753
	1922	10,123	6,700	16,823	8.3	245	1,727	864	34.2	704	34.0	13,350	196	192,790	975,147
Del., Lack. & Western	1923	11,407	13,519	24,926	3.6	30	1,731	842	27.9	546	28.3	13,712	241	492,329	3,447,567
	1922	15,939	6,693	22,632	11.6	6	1,655	771	25.2	599	33.8	13,635	191	493,539	3,418,033
Erie (inc. Chic. & Erie)	1923	21,150	39,295	60,445	8.6	....	1,996	969	28.9	634	31.8	16,588	159	594,029	4,190,934
	1922	38,215	17,553	55,768	19.0	5,275	1,940	905	28.2	518	28.3	12,505	154	676,079	4,721,971
Lehigh Valley	1923	17,858	17,131	34,989	6.0	....	1,660	848	30.6	419	19.5	11,132	202	348,193	2,711,791
	1922	30,374	9,206	39,580	10.7	3,254	1,742	816	28.6	411	22.3	12,364	169	345,655	2,549,482
Michigan Central	1923	7,891	24,923	32,814	7.1	....	1,717	741	21.9	483	30.3	8,685	145	583,588	5,138,030
	1922	17,855	12,792	30,647	18.7	27	1,664	671	21.5	381	26.8	6,394	132	554,138	4,879,084
New York Central	1923	53,284	108,628	161,912	9.0	....	2,066	971	28.2	528	28.6	13,217	143	2,579,447	19,606,674
	1922	90,534	52,245	142,779	19.1	6,422	2,020	892	26.2	423	25.8	9,334	129	2,446,052	18,313,259
New York, Chic. & St. L.	1923	3,107	14,218	17,325	7.6	....	1,577	721	24.4	719	40.5	10,164	152	152,481	797,772
	1922	6,561	8,394	14,955	14.6	1,486	1,547	646	21.2	651	44.3	7,945	124	138,375	646,464
Pere Marquette	1923	5,250	20,242	25,492	4.1	....	1,417	715	27.2	363	18.1	4,243	160	265,555	1,244,626
	1922	10,668	11,051	21,719	14.0	1,000	1,500	642	24.2	339	21.1	3,358	132	252,891	1,242,956
Pitts. & Lake Erie	1923	8,042	11,759	19,801	20.3	....	2,456	1,405	43.1	467	17.7	40,006	87	116,154	600,422
	1922	19,817	8,244	28,061	39.4	101	2,465	1,384	41.2	192	7.8	23,586	85	110,819	559,707
Wabash	1923	7,321	16,043	23,364	2.8	....	1,566	676	21.8	577	34.7	5,577	174	438,108	2,472,053
	1922	12,266	10,277	22,543	12.1	596	1,470	649	23.9	602	36.0	5,610	168	550,030	2,873,416
Ohio-Indiana-Allegheny Region:															
Baltimore & Ohio	1923	46,269	57,418	103,687	9.3	....	1,596	800	30.0	578	28.4	11,501	204	1,482,213	9,320,005
	1922	69,810	34,297	104,107	15.2	7,503	1,637	827	31.9	482	23.3	9,579	189	1,459,900	9,202,852
Central R. R. of N. J.	1923	11,575	17,285	28,860	7.2	....	1,485	758	33.7	275	12.8	11,410	203	338,923	1,572,558
	1922	19,428	8,377	27,805	5.4	6,557	1,591	794	33.2	276	13.9	11,092	177	329,926	1,555,675
Chicago & Eastern Ill.	1923	9,805	7,132	16,937	19.2	....	1,558	780	30.2	393	20.0	7,036	207	237,258	1,493,889
	1922	14,726	3,175	17,901	8.1	2,807	1,481	748	30.7	315	16.1	5,959	182	221,394	1,479,900
Cleve., Cin., Chic. & St. L.	1923	10,899	25,865	36,764	6.3	....	1,902	949	29.9	633	30.7	9,786	149	730,036	4,422,956
	1922	19,705	17,372	37,077	11.9	1,027	1,793	848	30.0	526	29.4	8,172	139	682,113	4,215,824
Elgin, Joliet & Eastern[1]	1923	8,327	7,523	15,850	8.1	....	2,261	1,238	40.4	412	14.9	14,187	144	.....	.....
	1922	9,238	5,095	14,333	9.3	327	2,318	1,222	40.4	346	13.0	10,806	138	.....	.....
Long Island	1923	1,418	6,240	7,658	3.2	....	764	302	23.3	66	4.8	1,286	412	193,383	1,085,754
	1922	2,341	4,293	6,634	4.4	399	764	301	22.5	70	5.1	1,177	344	192,029	1,034,860
Pennsylvania System	1923	151,286	144,952	296,238	6.4	923	1,743	883	32.6	483	21.9	13,151	166	5,076,823	35,278,824
	1922	212,573	70,563	283,136	13.4	31,593	1,773	882	33.5	454	21.3	11,806	149	4,940,645	32,608,777
Philadelphia & Reading	1923	14,789	21,740	36,529	3.7	....	1,704	930	36.1	631	25.9	20,651	194	510,447	2,346,159
	1922	23,282	14,717	37,999	5.4	1,309	1,705	899	36.5	495	22.0	16,788	181	489,848	2,186,922
Pocahontas Region:															
Chesapeake & Ohio	1923	30,000	16,452	46,452	11.8	....	2,388	1,319	43.9	807	29.9	14,691	131	452,370	2,592,256
	1922	36,338	12,902	49,240	14.4	772	2,309	1,250	42.4	685	28.5	13,238	137	446,880	2,414,302
Norfolk & Western	1923	21,527	11,987	36,514	4.9	....	2,033	1,122	41.5	890	33.2	14,588	205	396,262	2,404,200
	1922	30,771	7,685	38,456	5.5	1,563	2,186	1,173	41.7	851	35.2	14,686	174	390,810	2,349,528
Southern Region:															
Atlantic Coast Line	1923	13,950	20,637	34,587	8.7	....	1,234	492	20.6	412	30.4	2,932	148	935,311	7,206,818
	1922	22,552	11,477	34,029	13.2	....	1,214	444	18.8	307	26.1	2,121	124	879,110	6,445,815
Central of Georgia	1923	1,874	7,149	9,023	5.5	....	1,109	541	25.5	640	32.9	3,027	184	355,492	2,000,092
	1922	4,032	4,229	8,261	14.4	....	1,142	523	22.2	460	26.9	2,000	150	325,619	1,730,750
Illinois Central (inc. Y. & M. V.)	1923	25,607	42,430	68,037	6.2	....	1,648	762	28.3	789	42.3	8,675	165	1,538,838	9,280,053
	1922	43,164	21,238	64,402	8.0	7,598	1,653	738	28.0	634	36.3	6,656	152	1,475,558	8,561,078
Louisville & Nashville	1923	23,596	25,701	49,297	11.4	49	1,139	566	30.9	632	30.8	6,204	199	1,020,741	6,106,039
	1922	37,430	14,810	52,240	11.0	74	1,150	556	31.3	555	28.9	5,774	185	1,030,175	5,966,361
Seaboard Air Line	1923	9,720	15,191	24,911	19.6	....	1,156	473	21.5	369	24.8	2,590	179	672,978	4,430,749
	1922	12,894	11,437	24,331	29.7	....	1,165	456	20.4	288	21.0	1,981	181	655,880	3,771,691
Southern Ry	1923	26,614	36,556	63,170	8.1	....	1,166	534	24.0	466	26.7	4,244	215	1,342,968	7,875,084
	1922	38,745	20,236	58,981	16.5	872	1,138	483	22.1	356	23.3	3,023	205	1,314,776	7,417,170
Northwestern Region:															
Chic. & N. Wn.	1923	32,530	47,520	80,050	6.9	4,246	1,192	518	24.4	378	23.2	3,571	205	1,548,714	9,458,910
	1922	45,362	26,216	71,578	7.6	4,200	1,176	484	23.4	342	23.2	2,926	191	1,596,290	9,595,516
Chic., Milw. & St. P.	1923	36,339	45,940	82,279	7.5	....	1,388	648	26.2	493	28.1	3,680	187	1,475,294	8,828,033
	1922	49,340	27,538	76,878	15.2	....	1,360	619	26.4	448	26.8	3,120	180	1,486,610	8,720,845
Chic., St. P., M. & O.	1923	1,997	10,308	12,305	10.3	110	1,002	450	23.8	436	25.4	3,107	202	296,014	1,660,397
	1922	3,582	10,852	14,434	14.2	627	1,000	431	22.4	315	19.4	2,637	190	313,663	1,719,187
Great Northern	1923	37,015	13,581	50,596	8.0	....	1,497	693	27.0	481	27.3	2,950	191	987,864	5,739,804
	1922	44,884	5,996	50,880	13.4	....	1,437	681	26.1	339	18.5	2,088	186	992,954	5,698,956
M., St. P. & S. Ste. M.	1923	13,823	10,340	24,163	7.2	223	1,145	565	24.6	441	23.3	2,447	149	429,090	2,303,189
	1922	18,593	5,758	24,351	12.8	1,409	1,091	503	23.0	324	19.4	1,809	149	437,935	2,371,966
Northern Pacific	1923	25,241	10,041	35,282	11.6	....	1,574	719	26.5	622	35.6	3,416	148	819,565	5,244,548
	1922	35,384	7,067	42,451	10.5	1,219	1,522	741	25.7	418	21.6	2,764	148	848,575	5,299,690
Ore.-Wash. R.R. & N. Co.	1923	5,721	4,043	9,764	3.5	....	1,370	644	25.2	463	24.5	2,067	226	257,031	1,625,495
	1922	6,217	2,886	9,103	3.3	2,898	1,400	688	27.3	470	23.1	1,976	231	254,515	1,641,974
Central Western Region:															
Atch., Top. & S. Fe	1923	38,516	20,809	59,325	7.8	4,562	1,492	576	21.5	547	37.6	3,288	168	1,757,642	12,977,272
	1922	48,196	11,597	59,793	8.2	10,810	1,430	549	20.9	410	29.0	2,504	161	1,618,495	12,007,339
Chicago & Alton	1923	6,123	7,838	13,961	6.9	....	1,325	624	28.0	519	29.0	7,169	211	290,913	1,701,087
	1922	9,491	4,852	14,343	3.6	800	1,315	599	28.9	476	27.2	6,759	196	274,180	1,574,003
Chic., Burl. & Quincy	1923	36,179	33,032	69,211	8.3	....	1,573	734	27.7	636	35.9	4,720	193	1,489,387	9,483,911
	1922	45,071	18,814	63,385	7.9	78	1,607	759	28.6	621	34.3	4,251	174	1,461,168	9,095,090
Chic., Rock I. & Pacific	1923	22,671	22,648	45,319	10.9	203	1,154	493	22.4	499	31.4	2,960	208	1,286,881	7,216,540
	1922	32,628	14,788	47,416	9.4	5,643	1,157	488	22.8	433	28.3	2,682	188	1,297,981	7,237,221
Denver & R. G. Wn.	1923	10,877	3,361	14,238	8.6	867	1,197	591	28.4	312	15.5	1,712	265	228,110	1,470,298
	1922	12,770	3,073	15,843	14.1	1,824	1,325	642	28.9	285	14.9	1,743	221	228,650	1,526,571
Oregon Short Line	1923	4,826	3,812	8,638	7.2	139	1,383	643	27.0	844	44.4	3,080	151	281,954	1,975,455
	1922	6,190	3,399	9,589	6.8	595	1,439	723	30.6	838	38.7	3,406	150	285,097	1,952,525
Southern Pacific	1923	17,932	21,251	39,183	5.2	777	1,689	700	22.8	689	43.1	3,898	151	1,324,680	10,816,967
	1922	23,335	17,033	40,368	6.8	4,139	1,632	683	23.3	503	31.1	2,880	158	1,312,498	10,138,206
Union Pacific	1923	12,227	9,109	21,336	10.3	1,033	1,591	648	20.5	954	62.6	5,490	170	858,422	6,691,690
	1922	17,889	7,083	24,972	13.0	2,766	1,557	685	23.3	772	45.2	5,259	164	860,822	6,688,362
Southwestern Region:															
Gulf, Colo. & S. Fe	1923	5,918	4,319	10,237	5.4	658	1,417	635	25.8	4,736	27.6	2,555	156	194,936	1,094,961
	1922	7,913	3,298	11,211	4.9	854	1,442	612	21.1	3,537	22.5	2,093	152	193,846	1,099,208
Missouri, Kansas & Texas	1923	8,363	7,440	15,803	8.7	....	1,540	638	23.0	347	23.3	3,309	166	271,143	1,974,161
	1922	8,823	5,180	14,003	7.3	3,946	1,593	632	22.7	298	21.7	2,518	153	165,620	1,949,039
Mo., Kans. & Tex. of Tex.	1923	379	8,708	9,087	12.9	....	1,079	449	23.5	335	21.5	1,753	196	260,758	1,628,120
	1922	368	11,021	11,389	7.1	3,184	1,195	465	23.3	248	18.2	1,623	170	267,105	1,615,560
Missouri Pacific	1923	21,036	32,977	54,013	8.4	....	1,410	673	25.6	412	21.3	3,130	185	989,716	5,636,741
	1922	32,608	18,555	51,163	9.6	1,946	1,389	644	26.3	441	24.4	3,088	163	952,574	5,557,892
St. Louis-San Francisco	1923	13,883	20,307	34,190	7.6	....	1,049	472	25.2	419	24.2	3,059	220	750,491	4,112,487
	1922	20,510	8,788	29,298	8.4	....	1,035	455	21.9	391	23.7	2,404	199	746,609	4,160,642
Southern Pac. Lines (in Texas and Louisiana[2]	1923	6,198	13,602	19,800	5.1	900	1,300	579	25.9	588	34.2	3,166	135	541,239	3,567,823
	1922	9,060	13,221	22,281	11.8	2,026	1,197	526	25.4	421	25.4	2,531	137	542,137	3,476,663
Texas & Pacific	1923	3,975	7,250	11,225	15.1	....	1,331	539	22.3	412	27.6	2,366	166	290,231	1,830,943
	1922	6,486	5,047	11,533	18.3	....	1,247	498	22.0	335	23.4	1,980	157	296,650	1,920,248

Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to Revision.

General News Department

The Railroad Labor Board, on Wednesday re-elected B. W. Hooper, chairman, and G. W. W. Hanger, vice-chairman.

At the fourth annual convention of the Purchases and Stores division of the American Railway Association, held on May 15, 16 and 17 at Chicago, 358 persons registered, representing 85 railroads. The number of representatives from some of the leading roads included 80 from the Pennsylvania; 25 from the Chicago, Milwaukee & St. Paul; 18 from the Chicago, Rock Island & Pacific; 15 from the Baltimore & Ohio; 13 from the Atchison, Topeka & Santa Fe; 12 from the Union Pacific; 11 from the Atlantic Coast Line; 11 from the Illinois Central; 10 from the Southern; 8 from the Chicago, Burlington & Quincy; 8 from the Chicago & North Western; 8 from the Great Northern; 7 from the Missouri, Kansas & Texas; 6 from the Missouri Pacific; 5 from the Lehigh Valley; 5 from the Wabash; 4 from the Norfolk & Western and 4 from the Northern Pacific.

New York Railroad Club Annual Dinner

The executive committee of the New York Railroad Club at its monthly meeting on Friday, May 18, decided to hold the 1923 annual dinner of the club at the Hotel Commodore on Thursday evening, December 6.

Reduction in Freight Claims

The reduction of freight claim payments this year will be greater than in 1922, judging by the summary made by the Freight Claim division of the American Railway Association for the month of January. On the roads making reports the aggregate amount charged to loss and damage in January, 1923, was $3,570,566 in the same month of 1922, or a decrease of 29.6 per cent.

Motion for Early Test of Recapture Clause

Solicitor General Beck of the United States has filed a motion in the United States Supreme Court to advance for early hearing next term the case in which the Dayton-Goose Creek sought to enjoin the Interstate Commerce Commission from attempting to collect one-half of the company's net railway operating income in excess of 6 per cent, involving the constitutionality of the so-called recapture clause of the transportation act. The injunction was denied by the lower court.

Additional Pensions on Canadian Lines

The Canadian National has laid before the interested employees a plan for a general pension scheme designed to bring within the benefits of the pension rule those employees not now included. Of the different railroads or systems included in the National lines two, the Grand Trunk and the Intercolonial, already have pension rules. The new scheme, taking in the Canadian Northern, the Grand Trunk Pacific and other sections, will add an estimated number of 45,000 to those enjoying pension benefits.

Locomotive Conditions in April Best Since July, 1922

Interstate Commerce Commission's monthly report to the President is the best since July, 1922. In April 5,266 locomotives were inspected by the Bureau of Locomotive Inspection, of which 3,049, or 58 per cent, were found defective and 511 were ordered out of service. The percentage of those inspected found defective is the lowest that has been reported for any month since the shopmen's strike began last July. For the months of August, September and October, 1922, the percentage was 71. During the same month (April) 96,940 freight cars were inspected by the Bureau of Safety, of which 7.3 per cent were found defective and 1,983 passenger cars, of which 1 per cent were found defective. In April, 1922, 4½ per cent of the freight cars inspected were found defective and 0.9 per cent of the passenger cars.

Claim Agents' Convention

The Association of Railway Claim Agents held its annual meeting at Brown Palace Hotel, Denver, Colo., on May 16, 17 and 18. The officers elected for the ensuing year are:

President, Willis H. Failing, Central of New Jersey; first vice-president, S. R. Brittingham, Seaboard Air Line; second vice-president, F. R. Haney, Canadian Pacific; third vice-president, Robert Irwin, Atchison, Topeka & Santa Fe; secretary and treasurer, H. D. Morris, district claim agent, Northern Pacific, St. Paul, Minn.

The next annual meeting will be held in May, 1924, at West Baden, Indiana.

Progressives' Valuation Conference

Senator La Follette has announced that replies received from those who have been invited to attend the conference on railroad valuation at Chicago on Friday and Saturday of this week assure the presence of representative citizens from all sections of the country. His list of those who had signified that they would either be present or send a personal or official representative included the governors of Kansas, Montana, Arizona, Iowa, Maryland, Wyoming, Colorado, Oklahoma; U. S. Senators Capper, Copeland, Frazier and La Follette; 25 Representatives; the mayors of Chicago, New York and St. Paul; officers of the various railroad labor organizations, and a number of representatives of farm and labor organizations, several members of state railroad or public utilities commissions, and a number of professors, experts, publicists, etc. Mayor Dever of Chicago was to speak on the interest of the cities in railroad valuation, Governor William E. Sweet of Colorado on the interest of the states, and William Jennings Bryan on public interest in railroad valuation.

Increases in Wages, North, South, East, West

Supplementing the account of extensive increases in the pay of several classes of railway employees, which appears on a preceding page, the following paragraphs cover items received as we go to press:

The Gulf Coast Lines, the Houston Belt & Terminal, the Pittsburgh & Lake Erie and the Lake Erie & Eastern have granted increases to Maintenance of Way employees ranging from one cent an hour to five dollars a month. These roads have also agreed that all daily or hourly employees not participating in the vacation and sick leave privilege are to be paid time and one-half for all time worked in excess of eight hours and on Sundays and holidays.

Clerical employees on the Louisville & Nashville have received advances ranging from one to three cents an hour.

The Florida East Coast has granted an approximate increase of $11 a month to maintenance of way men.

Mechanics in the Maintenance of Way Department of the Central of Georgia have received increases ranging from two cents an hour to five dollars a month.

The Norfolk Southern has increased the wages of clerks and Maintenance of Way men two cents an hour.

The Georgia Railroad has granted advances of approximately $10 a month to its Maintenance of Way men.

The Richmond, Fredericksburg & Potomac has granted increases to laborers and terminal employees ranging from three to five cents an hour.

Traffic News

The Golden State Limited of the Chicago, Rock Island & Pacific consisted, on May 15, of four sections from Los Angeles, Cal., to Chicago, and carried 900 passengers.

The New York, New Haven & Hartford, on May 19, announced the removal of all embargoes on eastbound freight. This announcement marks the subsidence of congestion, at various points, which has prevailed ever since the fuel shortage of last Winter.

W. B. Lanigan, general freight traffic manager of the Canadian Pacific, testifying before the Canadian Parliamentary Committee on Mines and Minerals gave $9.90 a ton as the lowest rate at which his company could undertake to transport Alberta coal to Toronto in train load lots. The Canadian government is interested in devising ways and means to supply Canada with Canadian coal. The provinces of Ontario and Quebec are now largely dependent upon supplies from the United States.

The Canadian Parliament has received a report from a Royal Commission, appointed to investigate charges of excessive freight rates on the Lakes, in which recommendation is made that carriers of grain by water between Canadian ports should be subject to the railway commission or to some similar body. The Royal Commission finds that probably a few leading carriers have been able to combine to keep freight rates higher than those made by United States lines for similar service. It is proposed tentatively that the Commission should fix maximum freight rates; but the report recognizes the difficulty of maintaining control of the situation by this means.

A temporary restraining order enjoining ticket brokers in Chicago from buying, selling or advertising reduced-rate, non-transferable railroad tickets was issued by Judge Carpenter of the United States District Court at Chicago on May 18. Scalpers have operated openly in Chicago although the State of Illinois has an anti-scalping law on its statute books and the courts have repeatedly declared the business illegal. The order will be followed by the prosecution of scalpers. It was procured through the efforts of the Railway Ticket Protective Bureau in anticipation of the possible increased scalping of tickets due to the low summer tourist rates which will soon become effective on western railroads.

Potatoes in New Jersey

The Pennsylvania reports the delivery in New Jersey this year, mostly from Maine, of 8,326 tons of potatoes for seed. These potatoes go mostly to Monmouth, Mercer, Middlesex and Burlington counties. There were hauled, altogether about 277,500 bushels, or enough to plant 22,000 acres, which, however, will constitute some reduction from the acreage of last year. Practically all of these potatoes are moved an average distance of about 675 miles.

The movement every year is concentrated into a brief period of time and all seed potatoes have to be carried in heated cars. This year the problem was greatly complicated by the unusual severity of the winter. Snow from 10 ft. to 12 ft. deep was encountered. It takes about 12½ bushels of seed potatoes to plant an acre and a normal yield is 275 bushels an acre.

THE INTERSTATE COMMERCE COMMISSION has denied the petition of the Western Maryland for a modification of its train control order to permit installation between Thomas, W. Va., and Davis, instead of on a division between Baltimore and Cumberland.

ONE MAN WAS KILLED and 14 persons injured at Oakland, Ohio, on May 16 when a passenger train of the Lake Erie & Western collided head on with a freight train. A misunderstanding of orders is believed to have been the cause of the collision.

Commission and Court News

Interstate Commerce Commission

The Interstate Commerce Commission has issued an opinion finding that a regulation of the Railroad Commission of Texas requiring carriers, at the request of shippers, to slat stock cars when furnished for the transportation of watermelons in carloads between points in Texas, results in unjust discrimination against interstate commerce, but it says that the unjust discrimination should be removed by cancellation of the charge for such service which is applied in interstate commerce. The case was instituted by the Texas railroad in the hope of securing an order for the elimination of the Texas regulation.

State Commissions

The railway commissioners of Canada, following an extended inquiry, have issued an order, dated March 27, amending the regulations for eye tests, as prescribed in general order No. 74, so as to permit enginemen of all grades, when re-examined, to take the outdoor test when they do not comply with the requirements of the indoor test.

Personnel of Commissions

Edward F. Grable, whose appointment by President Harding as a member of the labor group of the United States Railroad Labor Board was announced in the *Railway Age* of May 19, was born on November 12, 1866, in Cass county, Ind. He was educated in the elementary schools and attended a college at Paxton, Ill., for two terms. Mr. Grable entered railway service on August 7, 1895, as a carpenter on the Illinois Central. He was promoted to carpenter foreman in 1899, and on January 2, 1902, was promoted to supervisor, bridges and buildings, with headquarters at Memphis, Tenn. He left the service of the Illinois Central in March, 1907, when he was appointed building inspector on the Missouri Pacific, but in October, 1909, he returned to the Yazoo & Mississippi Valley as division carpenter foreman. Mr. Grable was elected general chairman of the Brotherhood of Maintenance of Way Employees for the Illinois Central in August, 1916. He was elected grand vice-president of the amalgamated organization, the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, in September, 1918, and in March, 1920, was elected grand president of the organization. Mr. Grable was instrumental in securing the intervention of President Harding in the strike of the shop crafts last summer, and through his withholding approval of the vote of the maintenance of way men in his organization in favor of a strike, prevented the spread of the tie-up to the maintenance of way departments. He was defeated for re-election as president of the maintenance of way men's brotherhood last Fall because of his stand on the strike question. Mr. Grable's appointment is for the full term of five years.

Court News

Reasonable Time to Allow Passenger to Produce Ticket

A passenger from Evansville to Birmingham, traveling with six children, discovered when asked by the conductor for his tickets on changing from one coach to another, that his pocketbook, money, checks and tickets were lost, misplaced or stolen, or that the tickets had not been returned to him by a flagman to whom he had shown them before changing cars. After the conductor demanded the tickets, from 5 to 10 minutes elapsed before Henderson was reached, where the passenger was ejected, he having admitted that he had no tickets to surrender and no money to pay the fare. The Alabama Supreme Court holds that, in the circumstances, this was ample time to allow the plaintiff, and it was error to refuse to give the general affirmative charge, with hypothesis in favor of defendant. Judgment for plaintiff was therefore reversed.—L. & N. v. Hamby (Ala.), 93 So. 698.

Foreign Railway News

Shop Wage Negotiations in Britain

The British railway companies have modified their shop wage reduction proposals to the unions to provide for a 2s. ($.50) per week reduction immediately and an additional reduction of 1s. ($.25) a week during the following month. The proposal so far has been presented only to the shop craft unions and not to the National Union of Railwaymen.

The shop craft unions are the regular metal trades unions, and include both railway shopmen and mechanics from outside industries in their membership. The National Union of Railwaymen is an industrial union which "caters" to all classes of railway employees. The shopmen are about equally divided in their affiliation with the craft unions and the N. U. R.

The purpose of the proposed wage reduction is to reduce the operating expenses of the railways so that further decreases in freight and passenger rates may be possible. The wages of metal trades workers in other industries are 6s. 6d. ($1.60) lower than those of men doing similar work for the railways.

Effort to Secure Capital for New Rail Connection with Mexico

An effort is being made by the Mexican government to secure American capital for completing the construction of the branch line of the National Railways of Mexico that is to run from Allende to Villa Acuna, situated just across the Rio Grande from Del Rio, Texas. The proposed line is about 75 miles long and part of the construction work is finished. Alejandro R. Vega, personal representative of President Alvaro Obregon, is now in the United States on an official mission to raise funds for constructing the branch road. He estimates that it will cost approximately one million dollars of American money to build the line and construct a bridge across the Rio Grande for the joint use of the National Railways and the Kansas City, Mexico & Orient. The chief importance of the project lies in the fact that it would mean the opening of a new international railroad gateway between the two countries and the establishment of a direct rail route between the middle western part of the United States and Mexico. The grade for the branch line of the Kansas City, Mexico & Orient from San Angelo to Del Rio was constructed several years ago and track-laying was about to be started when the road fell into financial difficulties from which it has not yet emerged. The route of the branch line of the National Railways is through the great irrigated plantation of Lorenzo Trevino. At Del Rio connection will also be made with the transcontinental line of the Southern Pacific.

Proposal to Revive the National Tehuantepec

If a proposition which has just been made to the Mexican government by the United Mexican Fruit Company of New York and New Orleans is accepted the National Tehuantepec Railroad may be rehabilitated and traffic over it raised to something like its former magnitude, prior to the opening of the Panama Canal. The company has purchased approximately 500,000 acres of land situated on the Isthmus of Tehuantepec and in the region closely bordering the trans-isthmian railroad and is preparing to grow bananas and other tropical fruits for export on a large scale. Negotiations are pending for the purchase of other tracts of land which will bring the total acreage owned by the company up to more than one million acres, it is stated. The United Mexican Fruit Company in its offer to the government proposes to take over and operate the National Tehuantepec Railroad under a long term lease, to rebuild the line, including the erection of new freight terminals, and to dredge the harbors of Puerto Mexico and Salina Cruz, the respective Atlantic and Pacific terminals of the railroad.

Besides the shipments of bananas, pineapples and other fruits over the National Tehuantepec the United Mexican Fruit Company plans to establish industrial plants of various kinds and to encourage the settlement and development of the lands tributary to the railroad outside by agricultural interests.

Equipment and Supplies

Locomotives

THE UNION RAILROAD is inquiring for 15 switching locomotives. These locomotives are to have a total weight in working order of 180,000 lb.

THE NEW YORK, NEW HAVEN & HARTFORD has ordered 5 switching locomotives from the American Locomotive Company. This is in addition to the order for 5 switching locomotives reported in the *Railway Age* of March 24.

Freight Cars

THE KANSAS CITY SOUTHERN is inquiring for 500 box cars.

THE ANACONDA COPPER MINING COMPANY is inquiring for 24 ore cars.

THE PUBLIC SERVICE GAS COMPANY, Philadelphia, Pa., is inquiring for 200 hopper cars of 55 tons' capacity.

THE SINCLAIR REFINING COMPANY, reported in the *Railway Age* of April 14 as inquiring for five tank cars of 6,000 gal. capacity and 10 tank cars of 8,000 gal. capacity, has ordered this equipment from the Standard Tank Car Company.

Passenger Cars

THE PACIFIC ELECTRIC is inquiring for 50 side-door passenger cars and will soon be in the market for a number of motor driven cars.

THE FLORIDA EAST COAST, reported in the *Railway Age* of April 28 as inquiring for 15 steel baggage cars, two mail cars and one dining car, has ordered this equipment from the Pullman Company.

Iron and Steel

THE PEORIA & EASTERN is inquiring for five 85-ft. and five 90-ft. girder spans.

THE NORFOLK & WESTERN has ordered 1,000 tons of structural steel from the Mt. Vernon Bridge Company.

THE ILLINOIS CENTRAL has ordered 112 tons of structural steel from the American Bridge Company.

THE CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS is inquiring for one 76-ft. and four 80-ft. girder spans.

THE CHICAGO, BURLINGTON & QUINCY has ordered 45,000 tons of steel rail from the Illinois Steel Company.

THE CHICAGO, BURLINGTON & QUINCY has ordered 112 tons of structural steel from the American Bridge Company.

THE CHICAGO & ALTON has ordered 581 tons of structural steel for viaducts at Auxvasse, Mo., from the Strobel Steel Construction Company.

THE DENVER & RIO GRANDE WESTERN has ordered 1,000 tons of structural steel for its shops at Denver, Colo., from the Virginia Bridge & Iron Works.

THE AKRON, CANTON & YOUNGSTOWN has ordered 150 tons of structural steel from the American Bridge Company and 150 tons from the McClintic-Marshall Company.

THE ILLINOIS CENTRAL has ordered 692 tons of structural steel consisting of 12 deck plate girder spans for use at Spaulding, Ill., from the American Bridge Company.

Machinery and Tools

THE DENVER & RIO GRANDE WESTERN is inquiring for 147 machine tools.

THE ATLANTIC COAST LINE has ordered one 80-ton coach hoist from the Whiting Corporation.

THE ELGIN, JOLIET & EASTERN is inquiring for a 1½ cu. yd. electric bucket crane for use at Joliet, Ill.

THE ATCHISON, TOPEKA & SANTA FE is inquiring for one 20-in. drill press and one 2,500-lb. single frame steam hammer.

THE CENTRAL OF NEW JERSEY has ordered one 25-ton electric gantry crane from the Milwaukee Electric Crane & Manufacturing Company.

THE ERIE is installing a motor-driven air compressor at Susquehanna, Pa. Purchased electric power will replace the need for added boiler capacity. At present a steam-driven compressor with a capacity of 2,650 ft. per min. is supplying the requirements of the shop. This will be replaced by a synchronous motor-driven compressor with a capacity of 3,600 cu. ft. The steam unit will be sent to Hornell, N. Y., and a smaller steam-driven unit now in service at Hornell will be installed at Susquehanna as an emergency unit. A 13-panel switchboard is also being installed and underground cables laid between the switchboard and the power lines which bring power to the shops. The switchboard provides for the control of the motor-driven compressor, two motor generator sets, one of which is to be installed, and the various distribution feeders for shop power, light and electric welders. Growing shop requirements have made improved power facilities necessary and 220-volt alternating current, 220-volt direct current and 110-volt direct current is furnished to the shop. The work should be completed by the latter part of July.

Miscellaneous

THE PENNSYLVANIA has ordered 10 steel car floats from the Bethlehem Shipbuilding Corporation.

THE CHILEAN STATE RAILWAYS, 141 Broadway, New York City, will receive bids until 12 o'clock noon, May 26, for the following supplies: 5 locomotive boilers; 61 superheater equipments; 241 locomotive axles; 124 tender axles; 1,170 car axles; 65 locomotive lubricators; 874 locomotive tires; 3,960 car tires; 70 locomotive steam gages; 800 plates for locomotive boilers; 1,250 pressed steel plates for car repairs; 1,000 spring couplers; 16,000 water gage and lubricator glass tubes; 2,300 seamless steel tubes for locomotive superheaters; 85 sets of superheater flues; 660 arch tubes; 46,620 locomotive flues of steel or charcoal iron; 300,000 kilos of lubricating oils for car axles; 200,000 kilos of locomotive engine oil; 20,000 kilos of superheater oil; 2,500 liters of light engine oil for machine shop use; 2,000 liters of dynamo oil; 70,000 liters of signal oil; 2,000 liters of automobile oil; 11,000 kilos of driving box compound; 80,000 kilos of cotton waste; 30,000 kilos of cut nails; about 12,000 kilos of wire nails, about 5,430 gross of iron and bronze screws and 215 grinder wheels.

Signaling

THE ILLINOIS CENTRAL is to install automatic block signals on its line between Decatur, Ill., and Hervey City, 10 miles and between Fulton, Ky., and Frogmoor, Tenn., 60 miles.

THE SOUTHERN PACIFIC has ordered from the Union Switch & Signal Company material for the installation of automatic block signals from Bayou Sale, La., to Cade, 37 miles, double track; and also for one interlocking plant and the revision of three others.

THE CHICAGO, BURLINGTON & QUINCY has awarded a contract to the Federal Signal Company for the installation of automatic block signals from East Winona, Wis., to Purdy, a distance of 15 miles; from Alma to Stockholm, 22 miles, and from Diamond Bluff to Prescott, 11 miles, all single track. The installation between East Winona and Purdy will be a continuation of that between Lytle and East Winona, which was put into operation on May 10. This company has also put into operation automatic signals between Indianola, Neb., and Arapahoe, 29 miles.

Supply Trade News

The Whitman & Barnes Manufacturing Company has moved its New York office to 99 Chambers street.

The Locomotive Lubricator Company has moved its offices from 6 North Michigan avenue, Chicago, to 2443 Sheffield avenue.

Joseph T. Ryerson & Son, Inc., has moved its offices from 910 Corn Exchange building, Chicago, to 1736 Illinois Merchants Bank building.

E. W. Price, representative of the Laclede Steel Company, has been promoted to manager of sales in charge of the northern district, with headquarters at Chicago.

The Gibb Instrument Company, Bay City, Mich., manufacturers of electric welding equipment, have been appointed distributors of the General Electric Company's arc welding electrodes in the middle west.

J. R. Sexton, division engineer of the Erie, with headquarters at Huntington, Ind., has been appointed railway sales manager of the **H. H. Robertson Company,** with headquarters at Chicago. Mr. Sexton was born on January 18, 1888, at Long Branch, N. J., and was graduated from Rutgers College in June, 1911. He entered railway service in 1910 as a rodman on the Lehigh Valley and from August 1, 1911, to October 13, 1913, was chainman, rodman, instrumentman and inspector on the New York Central. On the latter date he resigned to become resident engineer for the Erie, which position he held until March 1, 1915, when he was promoted to assistant division engineer of the Mahoning division. From April 1, 1916, to May 1, 1917, he was division engineer of the Meadville division and from the latter date until March 1, 1920, he was division engineer of the Marion and Chicago division. On March 1, 1920, he was promoted to regional engineer of the Chicago region, with headquarters at Chicago, Ill., which position he held until December 1, 1922, when, owing to the consolidation of regions, he was again appointed division engineer of the Marion and Chicago division, with headquarters at Huntington, Ind.

J. R. Sexton

Higgins & Company, Chicago, representatives of the American Valve & Meter Company and the St. Louis Frog & Switch Company, have been appointed general sales agents throughout the United States for the Cook Standard Tool Company.

The Detroit Steel Products Company, Detroit, Mich., will establish a branch factory at Emeryville, Cal., which will have 83,000 sq. ft. of space. **A. Lum** has been appointed manager of the plant and will have charge of sales on the Pacific Coast.

L. N. Selig, assistant to the president of the **General American Tank Car Corporation** with headquarters at East Chicago, Ind., has been appointed acting director of purchases, succeeding **C. H. Coyle,** vice-president and director of purchases, resigned. **R. M. McFarland,** storekeeper with headquarters

at East Chicago, has been promoted to assistant purchasing agent with the same headquarters.

E. R. Riley, district manager of the Alexander Brothers Belting Company, a subsidiary of Armour & Company, with headquarters at Chicago, has been elected vice-president of **Warren Corning & Company,** with the same headquarters. This company has moved its offices to 908-10 Fisher building and will be distributors of the Fairbanks Company's valves and the Dart Manufacturing Company's unions.

The Railroad Supply & Equipment Exchange Corporation has been incorporated in Illinois for the purpose of erecting, in Chicago, a building to be used as the central headquarters for the railway supply trade of the United States. The company expects to erect and operate a building which will be large enough to house permanent and transient exhibits of railway equipment and supplies, office space for supply manufacturers and club rooms. Harry Vissering, president of the Harry Vissering & Company, Chicago, is president; T. G Kroehler is vice-president and R. W. Lyons is secretary and treasurer. It is planned to design the building for exhibits that will remain in place for long periods. The first floor will be given over to freight and passenger cars and locomotives. The second floor will hold lighter machinery, tools, signaling devices and other railway supplies. About 14 floors above the exhibition floors will be allotted to offices for supply companies at a rental which it is calculated can be made much less than present rates in many offices. The upper floors of the building will be made into from 300 to 350 rooms with sleeping accommodations; also a swimming pool and a gymnasium. It is also planned to arrange on one of the upper floors an auditorium which may be used by conventions. The district favored for the location of the building is north of the Chicago river and near the Municipal pier. Arrangements have been made for financing the construction of the building and these will be put into effect when tentative leases have been secured.

Westinghouse Electric & Manufacturing Company

The net income of the Westinghouse Electric & Manufacturing Company for the year ended March 31, 1923, was $12,263,486 as shown by the company's annual report. This compares with $5,837,389 in 1922. Gross sales for the year were $125,166,115, which represents an increase of $25,444,089 over the sales of last year. The bookings of new business steadily increased during the year and the value of unfilled orders at the close of the year was $61,914,237, as compared with $50,740,696 at the close of the previous year. The consolidated general balance sheet follows:

ASSETS

Property and plant	$50,055,473
Investments	16,174,468
Cash	7,797,891
United States bonds	50,800
Cash on deposit for matured bonds, etc	60,633
Notes receivable	6,808,497
Accounts receivable	23,204,843
Inventories	68,971,104
Other assets	5,574,845
Total	$178,698,554

LIABILITIES

Capital stock:	
Preferred	$3,998,700
Common	70,813,950
Funded debt	36,247,000
Current liabilities	16,607,025
Reserves	2,477,737
Profit and loss—surplus	48,554,142
Total	$178,698,554

Obituary

Elisha H. Talbot, retired publisher and founder of the *Railway Age*, died at his home in New York on May 22 at the age of 83.

J. H. Cross, formerly western manager of the service department of the *Railway Age* and allied publications and later advertising representative for these publications, died on May 22. In 1918 Mr. Cross left these publications to form an advertising agency.

H. F. Lowry, former division freight agent of the Pennsylvania, with headquarters at Cleveland, Ohio, died in that city on May 10. Mr. Lowry retired from active service on August 1, 1918.

Prof. Dr. Hans Goldschmidt, inventor of the Thermit process, died suddenly in Baden-Baden, Germany, on May 20, 1923, after a stroke. Prof. Goldschmidt was born in Berlin, Germany, on January 18, 1861. After having been graduated from the "gymnasium" of Altenburg, he studied chemistry, physics and natural sciences at the universities of Berlin, Leipzig, Heidelberg, Strassburg and at the Institute of Technology at Charlottenburg. He received the degree of Ph. D. from the University of Heidelberg in 1886.

In 1887, Prof. Goldschmidt entered the firm of Th. Goldschmidt, Essen Ruhr, Germany, in joint partnership with his brother Dr. Karl Goldschmidt. The attention of the latter was applied mainly to the business management of the company, while Prof. Hans Goldschmidt devoted himself to scientific research. Under their joint guidance, the firm grew to international importance, with agencies and allied companies throughout the world.

Prof. Goldschmidt's most important invention was the Thermit process, now used extensively all over the world for welding iron and steel sections, and for producing metals and alloys of high purity.

Prof. Goldschmidt visited this country frequently and was president of the Goldschmidt Thermit Company, now Metal & Thermit Corporation, from 1904 to 1916.

Trade Publications

SOUTHERN PINE.—The Southern Pine Association, New Orleans, has issued a large-sized, 12-page, illustrated bulletin of technical and general information on Southern pine and its uses. The text deals with the availability, distribution and grading rules for Southern pine lumber; the method of laying and caring for wood block and other types of flooring; and a number of tables of strengths of green and air-dried timber, approximate changes of properties with changes of moisture content, etc.

ERIE LUBRICATED CATERPILLAR MOUNTINGS.—The Erie Steam Shovel Company, Erie, Pa., has issued a large size, 20-page illustrated booklet devoted to a description of the lubricated caterpillar type mountings manufactured by this company. The text of this booklet describes in detail the method of construction and classes of materials used, the manner in which the link pin lubrication and the bushing of the link pin bearings is secured as well as its protection. It also shows how Erie wheel type shovels and cranes can be converted into caterpillar types. Numerous photographs are used to illustrate all of the points treated in the text.

WATERPROOFING METHODS AND MATERIALS.—A 32-page, illustrated, large-size bulletin has recently been issued by Gardner & Lewis, Inc., New York, with an enclosed set of specifications for the Karnak waterproofing manufactured by this company. The bulletin gives a detailed summation of the requirements of various technical societies for waterproofing as well as the results of numerous tests made by laboratories and consulting engineers. A table is included of a large number of railway and other bridge and building structures, showing the asphalt specifications at various temperatures and the cloth specifications for each structure. Considerable space is given to the discussion of the various classes of asphalts and membranes and their characteristics. Methods of construction are explained and illustrated for specific problems.

APPARATUS FOR DETERMINING STRESS DISTRIBUTION.—Designing engineers who have endeavored to study stress distribution in complex structures or machinery, through the construction of flexible models, will be interested in a pamphlet issued by Adam Hilger, Ltd., London, England, describing Professor Coker's apparatus for accomplishing this result with the aid of polarized light. By using transparent celluloid models of the structure it is desired to investigate, the variation and intensity of stress is portrayed in the colors of the spectrum, and by comparing these colors with those of a "calibration member," subjected to known stresses, it is possible to analyze the action of complex structures under load to a degree of accuracy said to come within two per cent. The pamphlet is illustrated with photographs and diagrams of the equipment and also of specimens subject to test.

Railway Construction

ATCHISON, TOPEKA & SANTA FE.—This company contemplates the construction of a branch line approximately 150 miles long from Roswell, N. M., to Lubbock, Tex., or Slaton. Surveys of the route have been completed and purchases of land on the right-of-way are now being negotiated.

ATCHISON, TOPEKA & SANTA FE.—This company has authorized the construction of a 1,000-ton reinforced concrete coaling station at Argentine, Kan., and a 600-ton reinforced concrete coaling station at La Junta, Col. A new brick passenger station will be constructed at Cushing, Okla., and will relocate the present one and remodel it for use as a freight station and office building. Additions to the company hotels at Seligman, Ariz., and Williams have also been authorized. This company will construct an ice plant at Needles, Cal., with a daily capacity of 200 tons and storage capacity of 10,000 tons with a 25,000-ft. icing dock. Included in the project are the relocation of the present double tracks, the construction of additional side track facilities and water facilities.

ALASKA RAILROAD.—The Secretary of the Interior has authorized the building of a spur 4½ miles long from the Matanuska branch of the Alaska Railroad to what are known as the Moose Creek coal mines in the Matanuska, Alaska, field. These mines are said to contain a good quality of steam coal suitable for export and for use on the government railroad. The estimated cost of the new construction work is $125,000 and the chairman of the Alaskan Engineering Commission estimates that it will save the railroad nearly the entire cost during the first year. Two areas now covered by government coal leases, upon which a large amount of money has been expended in preliminary development work, will be reached by the proposed spur. The cost of the improvement will be contributed in part by the lessees of the coal mining properties.

BALTIMORE & OHIO.—This company has awarded a contract to the Fort Pitt Bridge Works covering the fabrication of plate girder spans for bridges at Flemington, W. Va., and Meadowbrook, W. Va., on the Monongah division, and a quantity of structural material required for remodelling a second-hand span to be installed at Wahlville, Pa., on the Pittsburgh division. Approximately 80 tons of material is involved.

CHICAGO & NORTH WESTERN.—This company has awarded a contract to the C. W. Gimble Company, Chicago, for the construction of a roundhouse and shop buildings at Madison, Wis., reported in the *Railway Age* of May 12. A contract has been awarded to Duffy & Jutton, Milwaukee, Wis., for the grading and track work on this project. Approximately five miles of storage and switching tracks will be laid.

CHICAGO, NORTH SHORE & MILWAUKEE (ELECTRIC).—This company contemplates the re-location of its main line in Wilmette, Ill., and Winnetka. Negotiations are now under way for the purchase of land for the proposed right-of-way.

FORT WAYNE UNION.—The Interstate Commerce Commission has issued a certificate authorizing this company to build a line near Fort Wayne, Ind., from a connection with the New York, Chicago & St. Louis, to a connection with the Pennsylvania, a total distance of approximately 8,000 feet. The company is controlled jointly by the New York, Chicago & St. Louis, New York Central, Pennsylvania and Wabash.

FT. WAYNE UNION.—This company will construct 8,000 ft. of new line near Fort Wayne, Ind., at a cost of approximately $218,000 to provide transfer facilities between other roads entering Fort Wayne.

FORT WORTH & DENVER CITY.—This company plans the construction of a new paint and coach shop at Childress, Tex., to replace the building recently destroyed by fire with an estimated loss of $225,000.

GALVESTON, HARRISBURG & SAN ANTONIO.—This company will construct an eight-stall addition to the roundhouse at El Paso, Tex., and will also erect an addition to the blacksmith shop, a washroom and a fuel oil station.

GRAND TRUNK.—This company contemplates the construction of a freight classification yard at Trowbridge, Mich.

ILLINOIS CENTRAL.—This company has authorized the construction of a brick freight and passenger station at Bethany, Ill., and of a second-floor on the freight house at Cedar Rapids, Iowa, 30 ft. by 36 ft. A 300-ton coaling station will be constructed at Council Bluffs, Iowa and a coal hoist with sanding facilities at East St. Louis, Ill. Authorizations have also been made for two 100-car storage tracks at Council Bluffs, Iowa; 2,000 ft. of passing tracks at Craigville, Ill.; 4,000 ft. of passing tracks at Bainbridge, Ill.; 3,000 ft. of passing tracks at Lementon, Ill.; and two 60-car passing tracks at Marion, Ill. A contract has been awarded to Joseph E. Nelson & Sons, Chicago, for the construction of an engine house at Central City, Ky., as reported in the *Railway Age* of May 19, and one to the Ellington-Miller Company, Chicago, for the construction of a passenger station at Morganfield, Ky., as reported in the *Railway Age* of February 17 and for the construction of foundations for the old passenger station at Champaign, Ill., which is to be re-located and used as an office building.

LOUISVILLE & NASHVILLE.—This company contemplates the construction of 40 miles of second track between Pineville, Ky., and Harlan.

LOUISVILLE & NASHVILLE.—This company in conjunction with the Southern Pacific will construct a levee along the Mississippi river at New Orleans, La., at a cost of approximately $100,000.

MOBILE & OHIO.—This company plans the construction of a new machine shop at Jackson, Tenn.

NEW YORK CENTRAL.—This company will construct an additional car repair shop building at Adrian, Mich.

NEW YORK, CHICAGO & ST. LOUIS.—This company has awarded contracts to P. T. Clifford & Son, Valparaiso, Ind., for a grade change at Willvail, Ind., and for second track work at Raber, Ind.; also for the construction of a second main track from Fort Wayne, Ind., to Hadley, and from Fort Wayne to New Haven.

NUECES VALLEY, RIO GRANDE & GULF.—This company has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension from Beeville to Laredo, Texas.

OREGON SHORT LINE.—This company has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from Rogerson, Idaho, to Wells, Nevada, 97.7 miles.

SOUTHERN PACIFIC OF MEXICO.—This company has awarded a contract to the Utah Construction Company, San Francisco, Cal., for the construction of the new line from Tepic, Mexico to La Quemada, as reported in the *Railway Age* of April 21.

UNION PACIFIC.—This company contemplates the construction of a branch line 100 miles long from Rogerson, Idaho, to Wells, Nevada.

UNION PACIFIC.—This company contemplates the re-location of a part of its line in Baker county, Ore., at a cost of over $500,000 to permit the development of an industrial enterprise which the present right-of-way obstructs. Under the preliminary agreement, the railroad will pay one-fourth of the total cost.

TELEGRAPH OPERATORS are now advertised for by the United States Civil Service Commission, examinations to be held throughout the country on July 11. Application blanks may be had from the civil service examiners in any of the large cities. There are vacancies in the office of the Bureau of Agricultural Economics at Washington, at $1,400 plus the usual bonus of $20 a month; and in the Weather Bureau at $1,200 a year plus the bonus. Applicants must have had at least two years of recent experience in some office of considerable importance.

Railway Financial News

ATLANTIC COAST LINE.—*Annual Report.*—The annual report for the year ended December 31, 1922 shows a net income of $11,604,074 as compared with $1,790,569 in 1921. A selection of the principal items in the income account follows:

	1922	1921
Freight	$48,857,558	$44,556,741
Passenger	15,871,367	16,787,056
Total railway operating revenues	70,823,345	66,730,768
Maintenance of way and structures	8,434,956	9,859,445
Maintenance of equipment	14,297,181	15,234,782
Traffic	1,276,123	1,161,024
Transportation	26,018,260	29,703,406
General	1,649,687	1,669,649
Total railway operating expenses	52,033,448	58,005,833
Net revenue from railway operations	18,789,897	8,724,935
Railway tax accruals	4,275,000	3,075,000
Total operating income	14,433,024	5,580,285
Total non-operating income	4,907,868	4,423,110
Gross income	19,340,892	10,003,395
Total deductions from gross income	7,736,818	8,212,826
Net income for year	11,604,074	1,790,569
Income applied to sinking and other reserve funds	21,877	23,870
Income appropriated for investment in physical property	144,124	141,004
Income balance transferred to credit of profit and loss	11,438,073	1,625,694

BOSTON & MAINE.—*Asks Authority for Equipment Trust Certificates.*—This company has applied to the Interstate Commerce Commission for authority for an issue of $2,115,000 of 6 per cent equipment trust certificates to be sold on a 6½ per cent basis.

CAMBRIA & INDIANA.—*Equipment Trust Certificates Authorized.*—This company has been authorized by the Interstate Commerce Commission to assume obligation and liability in respect of $1,700,000 of equipment trust certificates to be sold at not less than par.

CENTRAL OF NEW JERSEY.—*Equipment Bonds Authorized.*—The Interstate Commerce Commission has authorized an issue of $3,750,000 of equipment bonds to be sold at not less than 96.

CHICAGO, ROCK ISLAND & PACIFIC.—*Asks Authority for Equipment Trust Certificates.*—This company has been authorized by the Interstate Commerce Commission to assume obligation and liability in respect of $8,550,000 of equipment trust certificates to be sold at 96.1801.

$7,000,000 Notes sold.—A syndicate headed by Speyer & Co., Chase Securities Corporation and Dillon, Read & Co. has sold $7,000,000 Chicago, Rock Island & Pacific three-year 5½ per cent secured gold notes.

CIMARRON & NORTH WESTERN.—*Asks Authority to Abandon Line.*—This company has applied to the Interstate Commerce Commission for authority to abandon that part of its line from Ponil Park to South Ponil, New Mexico, 14 miles.

CLEVELAND UNION TERMINALS COMPANY.—*Asks Authority for Bond Issue.*—This company has applied to the Interstate Commerce Commission for authority to issue and sell $15,000,000 of first mortgage, 5 per cent, 50-year sinking fund gold bonds guaranteed by the New York Central; Cleveland, Cincinnati, Chicago & St. Louis and New York, Chicago & St. Louis.

COLUMBUS, INDIANA & EASTERN.—*Sale of Lima-Defiance Division.*—The sale of the Lima-Defiance division to C. G. Taylor and J. A. Murray for $125,000 has been ordered by Judge Killits.

GRAYSONIA, NASHVILLE & ASHDOWN.—*Authorized to Issue Securities.*—This company has been authorized by the Interstate Commerce Commission to issue $600,000 of common stock and $300,000 of 20-year, 6 per cent, first mortgage bonds to be pledged as collateral security for a loan from the United States Government of $200,000. The order is continued upon the expenditure of $186,000 of cash plus the proceeds of the loan for the rehabilitation of the railroad formerly owned and operated as a part of the Memphis, Dallas & Gulf.

GULF, MOBILE & NORTHERN.—*Authorized to Acquire Control.*—The Interstate Commerce Commission has authorized the acquisition by this company of control of the Meridian & Memphis by means of an operating contract.

INDIANA HARBOR BELT.—*Asks authority for Equipment Trust Certificates.*—This company has applied to the Interstate Commerce Commission for authority to assume obligation and liability in respect of $900,000 of 5 per cent equipment trust certificates.

INTERNATIONAL-GREAT NORTHERN.—*Application of Frisco Denied.*—See article on another page of this issue.

INTERSTATE.—*Authorized to Issue Securities.*—This company has been authorized by the Interstate Commerce Commission to assume obligation and liability in respect of $840,000 of equipment trust certificates and to issue $268,600 of capital stock to be sold at not less than par.

JOLIET & CHICAGO.—*Transfer Agent.*—The Metropolitan Trust Company has been appointed transfer agent of the $1,500,000 7 per cent guaranteed stock, according to The Chronicle. This road is operated under lease to the Chicago & Alton.

KANSAS CITY SOUTHERN.—*Authority to Abandon Branch Denied.*—The Interstate Commerce Commission has denied this company's application for a certificate authorizing it to abandon a portion of its Kansas City & Independence Air Line branch near Independence, Mo., about 1½ miles. The company represented that traffic on this line was not sufficient to justify continued operation, but it was claimed that the proposed abandonment would cause serious financial loss to coal and lumber dealers located on the tracks.

LEHIGH & HUDSON RIVER.—*Annual Report.*—The annual report for the year ended December 31, 1922, shows a net income of $138,641 as compared with $336,956 in 1921. The income account follows:

	1922	1921
Freight revenue	$2,240,094	$3,076,756
Passenger revenue	45,773	50,132
Total operating revenues	2,412,760	3,242,291
Maintenance of way and structures	314,957	381,911
Maintenance of equipment	438,251	607,376
Traffic	17,345	21,328
Transportation	1,082,166	1,326,640
General	95,054	92,587
Total operating expenses	1,947,728	2,429,843
Net revenue from railway operation	465,032	812,448
Railway tax accruals	163,331	145,308
Railway operating income	301,700	667,137
Non-operating income	46,939	9,740
Gross income	348,640	676,876
Total deductions from gross income	209,998	339,920
Net income transferred to profit and loss	138,641	336,956

LEHIGH VALLEY.—*Annual Report.*—The annual report for the year ended December 31, 1922, shows a net loss of $1,991,247 as compared with a net income of $10,050,798 in 1921. The corporate income follows:

Total operating revenues	$62,418,889
Total operating expenses	59,023,940
Net operating revenues	3,394,949
Railway tax accruals	1,993,216
Uncollectible railway revenues	Def. 7,266
Equipment rents—Net	1,066,941
Joint facility rents—Net	Def. 248,027
Net railway operating income	590,084
Other income	4,832,641
Total income	5,422,724
Deductions from income	7,413,971
Net income	Def. 1,991,247

MARYLAND, DELAWARE & VIRGINIA.—*Sale.*—The sale of this company's property in three parcels on May 7 under foreclosure proceedings instituted by the Girard Trust Company of Philadelphia brought $650,000. The E. B. Leaf Company of Philadelphia, as announced in the *Railway Age* of May 12, 1923, purchased the 77-mile railroad and one boat for $225,000. William B. Skeelton, of Lewistown, Me., representing certain of the bondholders, bought six of the steamers for $400,000 and N. W. Smith, assistant general manager of the Pennsylvania Railroad at Philadelphia, Pa., bought three of the vessels for $25,000.

MEMPHIS, DALLAS & GULF.—*Government Loan Denied.*—The Interstate Commerce Commission has denied an application of the receiver for a loan of $246,782 for 10 years for the purpose of rehabilitating the railroad property. The security offered consists of the cash proceeds of the loan pending the pledge of the bonds of the Graysonia, Nashville & Ashdown as and when issued. The commission says no loan can be made to the receiver because he is no longer a carrier. The property was sold by order of court as of August 31, 1922, to certain persons acting for the Graysonia company, which was not in existence during the statutory period for filing applications for loans.

MIDLAND VALLEY.—*Initial Preferred Dividend.*—The directors have declared an initial dividend of 2½ per cent ($1.25 per share) on the preferred stock, payable June 1 stock of record May 25.

Holders of voting trustees certificates of preferred stock will not be entitled to participate in the dividend until their certificates have been converted into preferred stock of the company at the office of the Girard Trust Company in accordance with the notice of April 25, 1923, of the termination of the voting trust agreement.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—*Common Stock Dividend.*—The Circuit Court of Appeals of St. Louis, Mo., on May 8 upheld the ruling of United States District Judge W. F. Booth, against the petition by preferred stockholders that no money be paid upon common stock until the preferred stock had received its customary seven per cent. The preferred stockholders in 1922 obtained an injunction holding up common stock payments on the ground that seven per cent annually was due them before any dividends could be paid to common shareholders.

MISSOURI PACIFIC.—*Annual Report.*—This company's annual report for 1922 is reviewed in an article on another page of this issue entitled, "Missouri Pacific Progress Hindered by Strikes." See also excerpts from annual report on adjacent pages.

MUSCLE SHOALS, BIRMINGHAM & PENSACOLA.—*Receivership.*—A bill of complaint was filed in the Federal court at Pensacola, Fla., on May 15, asking for the appointment of a receiver and seeking an enjoining order preventing the present officers from selling or otherwise disposing of any of the properties of the short line. The suit is brought in the name of W. L. Wacheb. The question of the enforcement of a laborer's lien by the Federal government is part of the proceedings. The plaintiff avers that two pay days have passed without the necessary checks being distributed, that $30,000 represents the sum owed labor and that the total indebtedness of the road is approximately $143,000.

NEW YORK CENTRAL LINES.—*Ask Authority for Equipment Trust Certificates.*—The New York Central, Michigan Central and Cleveland, Cincinnati, Chicago & St. Louis have applied to the Interstate Commerce Commission for authority to assume obligation and liability in respect of $17,340,000 of New York Central Lines 5 per cent equipment trust certificates.

NEW YORK, NEW HAVEN & HARTFORD.—*Equipment Notes Authorized.*—This company has been authorized to issue $1,192,000 of equipment notes in connection with the procurement of electric locomotives.

PHILADELPHIA & READING.—*Annual Report.*—The annual report for the year ended December 31, 1922, issued this week, shows a net income of $7,896,552 in 1922 as compared with $6,496,384 in 1921. A selection of the principal items in the income account follows:

	1922	1921
Freight—Coal	$30,260,680	$40,621,099
Freight—Merchandise	37,202,330	30,555,269
Passenger	9,950,155	10,233,086
Total railway operating revenue	81,934,751	84,924,228
Maintenance of way and structures	8,679,417	9,770,589
Maintenance of equipment	19,591,117	20,815,779
Traffic	743,530	704,781
Transportation	31,113,637	35,118,615
General expenses	1,743,021	1,886,357
Total railway operating expenses	62,055,322	68,361,308
Net revenue from railway operations	19,879,429	16,562,920
Railway tax accruals	3,243,766	1,728,270
Railway operating income	16,622,251	14,820,302
Non-operating income	434,245	853,537
Gross income	17,056,496	15,673,840
Deductions from gross income	9,159,943	9,177,456
Net income	7,896,552	6,496,383
Income applied to sinking and other reserve funds	48,674	53,790
Income appropriated for investment in physical property	1,811,978	3,055,961
Income balance	6,035,901	3,386,633

POTEAU & CAVANAL MOUNTAIN.—*Asks Authority to Issue Stock.*—This company has applied to the Interstate Commerce Commission for authority to issue $100,000 of common stock to be issued in connection with the acquisition and rehabilitation of the Fort Smith, Poteau & Western.

READING COMPANY.—*Court Approves Third Plan.*—The third modified segregation plan for the properties controlled by the Reading Company was approved in its entirety on May 22 by the United States District Court of Philadelphia. The court dismissed objections filed by Acting Attorney General Seymour and a few holders of the common and preferred stocks.

Counsel for the Reading Company and its underlying corporations are directed by the court to file the draft of a final decree of separation, before June 20, embodying the details of the plan and the exact terms of the bonds and mortgages to replace the general mortgage and bonds now standing against the Reading Company and the Philadelphia & Reading Coal & Iron Company.

Annual Report.—The report for the year ended December 31, 1922, issued this week, shows the following income account:

	1922	1921
Receipts	$20,594,743	$16,028,040
Expenses	310,029	144,051
	$20,284,714	$15,883,989
Interest, taxes, etc.	8,623,094	6,337,354
Surplus for the year	$11,661,620	$9,546,635

ST. LOUIS-SAN FRANCISCO.—*Application to Acquire I.-G. N. Denied.*—See article on another page of this issue.

SEABOARD AIR LINE.—*Authorized to Pledge Bonds.*—The Interstate Commerce Commission has authorized this company to pledge $2,725,000 of first and consolidated mortgage 6 per cent bonds with the Secretary of the Treasury as security for a government loan.

VIRGINIAN.—*Asks Authority for Equipment Trust Certificates.*—This company has applied to the Interstate Commerce Commission for authority to issue $5,700,000 of 5 per cent equipment trust certificates to be sold at 94.58 to the National City Company and Lee Higginson & Co.

WACO, BEAUMONT, TRINITY & SABINE.—*Asks Authority to Issue Securities.*—This company, formerly known as the Beaumont & Great Northern, which recently filed with the Interstate Commerce Commission application for a certificate authorizing it to acquire and operate a line from Trinity to Colmesmeil, Tex., has applied for authority to issue $1,149,000 of first mortgage, 6 per cent, 30-year bonds, $2,170,300 of common stock, $60,000 of 5 per cent equipment trust notes and 30 unsecured six months' notes for $2,500 each at 10 per cent.

Dividends Declared

Chestnut Hill.—75 cents, quarterly, payable June 4 to holders of record May 20.

Illinois Central, Leased Lines.—$2, semi-annually, payable July 1 to holders of record June 11.

Midland Valley.—Preferred, 2½ per cent, payable June 1 to holders of record May 25.

Trend of Railway Stock and Bond Prices

	May 22	Last Week	Last Year
Average price of 20 representative railway stocks	62.59	63.70	66.64
Average price of 20 representative railway bonds	82.83	82.72	86.65

Kadel & Herbert

Young Immigrants to Canada at C. P. R. Windsor Station, Montreal

Annual Report

Missouri Pacific Railroad Company—Sixth Annual Report

St. Louis, Mo., March 31, 1923.

TO THE STOCKHOLDERS:

The Board of Directors herewith submits report of the operations and affairs of the Company as of December 31, 1922.

CORPORATE INCOME STATEMENT

FOR THE YEAR ENDED DECEMBER 31, 1922, COMPARED WITH THE PREVIOUS YEAR

	1922	1921	INCREASE OR DECREASE
Railway Operating Revenues	$99,921,331.07	$109,785,949.76	—$9,864,618.69
Railway Operating Expenses	84,658,914.62	91,693,855.71	—7,034,941.09
Net Rev. R'lway Operat'ns.	$15,262,416.45	$18,092,094.05	—$2,829,677.60
Railway Taxes and Uncollectible Railway Revenue	$4,055,983.60	$4,396,528.73	—$340,545.13
Railway Operating Income	$11,206,432.85	$13,695,565.32	—$2,489,132.47
Other Operating Income	823,584.07	799,173.59	24,410.48
Total Operating Income	$12,030,016.92	$14,494,738.91	—$2,464,721.99
Deductions from Oper-ting Inc.	3,782,982.41	4,257,890.60	—474,908.19
Net R'way Operating Income	$8,247,034.51	$10,236,848.31	—$1,989,813.80
Non-Operating Income	2,463,783.34	3,061,557.37	—597,774.03
Gov'mnt Guar. under Transportation Act of 1920	.....	1,972,080.96	—1,972,080.96
Gross Income	$10,710,817.85	$15,270,486.64	—$4,559,668.79
Deductions from Gross Income	12,124,530.27	11,733,470.55	$391,059.72
Balance-Net Inc. transferred to Profit and Loss	Df. $1,413,712.42	$3,537,016.09	—$4,950,728.51

GUARANTY PERIOD

The claim of the company under the terms of Section 209 of the Transportation Act of 1920, guaranteeing for the six months, March 1 to August 31, 1920, one-half of the average annual Net Railway Operating Income of the Test Period, was prepared and filed with the Interstate Commerce Commission in accordance with its order of December 15, 1921. It is expected that final settlement will be made during the current year.

INCOME

A brief comparative statement of the Corporate Income is shown above, subdivided to indicate the "Net Railway Operating Income" defined in the Transportation Act of 1920.

A detailed statement of Federal and Corporate Income is given on page 8.

OPERATIONS

(Compared with Previous Year)

Every indication at the beginning of the year pointed to a period of successful operations, the first three months showing a gain in excess of $1,000,000 in Net Income.

Conditions were materially changed, however, by the strike of coal miners extending over a period of more than four months, from April 1 to August 25, inclusive, and the strike of railway shop employees, who declined to abide by the decision of the United States Railroad Labor Board, effective July 1, 1922.

The result of these strikes is reflected in the decrease in tonnage handled during the year, as well as in the freight revenue, the latter item also being affected by reductions in freight rates on specific commodities by an Order of the Interstate Commerce Commission, effective for some reductions on January 1, 1922, and for others on July 1, 1922.

Total Railway Operating Revenues for the year were $99,971,546.81, a decrease of $9,873,525.70, or 9.00 per cent.

The decrease in freight revenue amounted to $7,790,178.83, or 9.54 per cent.

The Total Number of Tons of Revenue Freight Handled decreased 3.31 per cent, while the Ton Miles decreased 6.79 per cent.

The Average Revenue Per Ton Per Mile was 12.32 mills, as compared with 12.70 mills in the previous year.

The decrease in tonnage of bituminous coal was 722,995 tons, or 14.91 per cent, with a consequent decrease in freight revenue.

Products of agriculture show a decrease of 863,487 tons, or 13.10 per cent, and the tonnage of clay, gravel, sand and stone, a decrease of 756,483 tons, or 21.56 per cent.

These reductions are attributable to the labor disturbances referred to above; the reduction in coal tonnage being a curtailment of traffic, while the reduction in products of agriculture and building material resulted largely from shortage of equipment and transportation disabilities growing out of inability to keep locomotives in adequate repair by reason of the railway shop forces being almost totally depleted by the strike.

The decrease in passenger revenue amounted to $2,342,018.20, or 12.17 per cent.

The Number of Revenue Passengers shows a decrease of 16.53 per cent, while the Number of Passenger Miles decreased 12.40 per cent, with an increase of 2.50 miles in the Average Haul Per Passenger.

The Average Revenue Per Passenger Per Mile was $0.0345, as compared with $0.0344 last year.

Notwithstanding extraordinary direct and incidental charges occasioned by the strikes of coal miners and of railway shop employees, Total Railway Operating Expenses were decreased 7.95 per cent.

FEDERAL VALUATION

The Bureau of Valuation of the Interstate Commerce Commission has completed the field work on the property of the company and has also completed the tentative engineering report. This engineering report was submitted to the company informally for review in November, and subsequently suggestions for changes in it made by the valuation department of your company. The land and accounting reports, both of which precede the so-called "tentative valuation," have not been received, but together with the tentative valuation itself are expected from the Commission during 1923.

PENSION SYSTEM

Since the inauguration on July 1, 1917, of the Pension System, 318 employees have been carried on the pension rolls. On December 31, 1922, there were 228 retired employees receiving pensions with an average monthly allowance of $49 involving a monthly expenditure of $11,186.80.

CAPITAL STOCK

No changes have been made in the Capital Stock during the year.

FUNDED DEBT

Funded Debt outstanding in the hands of the public increased $9,596,100, the detail of changes being shown on page 13.

First and Refunding Mortgage Bonds, Series D, to the amount of $18,095,500, were issued during the year and $18,000,000 together with $5,501,500 of the same series in the Treasury or a total of $23,501,500 were sold. The proceeds of the sale were applied to the retirement of First and Refunding Mortgage Bonds, Series B, maturing January 1, 1923, which were called and paid August 1, 1922, of which there were outstanding $13,641,000, and the balance applied to reimburse the Treasury for Road and Equipment expenditures made under the terms of that mortgage.

The remaining First and Refunding Mortgage Bonds, Series D, issued, amounting to $96,500, were retained in the Treasury which has been further augmented by the release of $106,000 of the same series held by the U. S. Government as collateral security upon the payment of $80,000 serial note matured January 15, 1922. The unpledged bonds of this series in the Treasury totals $2,018,500, of which $1,816,000 principal amount are carried as "Investment in Securities Issued, Assumed or Otherwise Carried as a Liability by the Accounting Company" and $202,500 nominally issued.

Equipment Trust Certificates amounting to $173,400 matured and were paid and $11,000 principal amount of General Consolidated Railway and Land Grant Mortgage Bonds were retired from the proceeds of sale of land grant lands.

The funded Debt Outstanding is shown on pages 14 to 16, inclusive. Detailed description of the Mortgages will be found on pages 19 to 25, inclusive.

LOANS AND BILLS PAYABLE

The Note for $70,000 covering surplus funds of the Missouri Pacific Hospital Association was paid during the year and no Notes or Bills Payable are now outstanding.

NEW LINES

No new lines were constructed. On March 1, 1922, the operated mileage was increased 41.13 miles by the addition of the line of the Arkansas Central Railroad extending from Ft. Smith to Paris, Ark., acquired by purchase. The operation of 193.26 miles of line between Alexandria and New Orleans, La., under agreement between the Missouri Pacific Railroad Company, Texas and Pacific Railway Company, and the Trans-Mississippi Terminal Railroad Company, was temporarily suspended August 14, 1922. The net decrease in mileage owned and operated, including these and other changes of minor importance, was 151.92 miles, details of which appear on pages 42 and 43.

ROAD AND EQUIPMENT

There were ordered for delivery, early in 1923, 46 Mikado Type Locomotives and 4 Mountain Type Locomotives.

The details of charges to Road and Equipment are shown on page 18, a summary of which follows:

New Lines Purchased		$1,099,558.60
Road		3,609,672.31
Equipment	$4,902,801.30	
Less Equipment Retired	2,525,604.19	2,377,197.11
General Expenditures		13.81
Assets and Liabilities not appraised June 1, 1917	Cr.	373,919.96
Total Charges to Road and Equipment		$6,712,521.87

In the following pages the Corporate and Federal Accounts have been consolidated to afford ready comparison of results of the year and with those of the previous year.

By Order of the Board of Directors,
B. F. BUSH, President.

PROFIT AND LOSS

DECEMBER 31, 1922.

Credit Balance, December 31, 1921		$33,910,094.16
Profit on Road Sold		4,607.66
Unrefundable Overcharges		15,502.98
Donations		83,506.91
Miscellaneous Credits		244,481.49
		$34,258,193.20
Less:		
Debit Balance Transferred from Income Acc.	$1,413,712.42	.....
Surp. App. for Investment in Physical Prop.	83,506.91	.....
Debt Discount Extinguished through Surplus	1,149,496.33	.....
Miscellaneous Appropriations of Surplus	400,000.00	.....
Loss on Retired Road	146,150.69	.....
Miscellaneous Debits	66,815.99	3,259,672.34
Credit Balance, December 31, 1922		$30,998,520.86

GENERAL BALANCE SHEET

DECEMBER 31, 1922, COMPARED WITH DECEMBER 31, 1921

Assets	Dec. 31, 1922	Dec. 31, 1921	Increase or Decrease
Investments:			
Inv. in Rd. and Equip.	$383,270,573.78	$376,558,051.91	$6,712,521.87
Imp. on Leased Ry. Prop.	5,119.57	1,078.88	4,040.69
Sinking Funds	21.97	1,294.72	—$1,272.75
Deposits in Lieu of Mortgaged Property Sold	230,859.64	88,689.09	140,170.55
Misc. Physical Property	2,334,811.70	2,385,255.25	—50,443.55
Inv'mts in Affiliated Companies—Pledged	5,178,412.44	6,004,125.65	—825,713.21
Inv'mts in Affiliated Companies—Unpledged	5,832,058.45	6,037,104.89	—205,046.44
Inv'mts in Securities Issued, Assumed or otherwise carried as a Liability by the Acc. Company—Pledged	4,165,065.10	4,165,065.10	.....
Inv'mt in Securities Issued, Assumed or otherwise carried as a Liability by the Acc. Company—Unpledged	1,650,934.90	1,976,585.65	—325,650.75

Other Investments—Pledged.	15,325,739.06	15,355,549.87	—29,810.81
Other Inv'mts—Unpledged..	21,686,921.09	18,259,947.78	3,426,973.31
Total	$439,680,517.70	$430,832,748.79	$8,847,768.91
Current Assets:			
Cash	$4,733,873.23	$1,941,990.59	$2,791,882.64
Special Deposits	1,465,136.19	935,274.73	529,861.46
Loans and Bills Receivable.	63,759.49	115,344.25	—51,584.76
Traffic and Car Service Balances Receivable	706,447.46	565,465.86	140,981.60
Net Balance Receivable from Agents and Conductors	1,839,510.79	2,356,038.31	—516,527.52
Misc. Acc. Receivable	3,945,171.73	4,847,802.57	—902,630.84
Material and Supplies	9,467,446.69	11,221,087.11	—1,753,640.42
Int. and Div'nds Receivable	368,254.81	464,814.26	—96,559.45
Rents Receivable	5,750.00	37,350.00	—1,600.00
Other Current Assets	248,589.54	242,535.29	6,054.25
Total	$22,873,939.93	$22,727,702.97	$146,236.96
Deferred Assets:			
Working Fund Advances	$253,701.33	$256,128.81	—$2,427.48
Other Deferred Assets	87,176.92	1.00	$87,175.92
Total	$340,878.25	$256,129.81	$84,748.44
Unadjusted Debits:			
Rents and Ins. Premiums Paid in Advance	$100,013.40	$57,135.08	$42,878.32
U. S. Govt. Guaranty under Transportation Act	5,027,909.88	5,027,909.88	.....
Other Unadjusted Debits	486,174.45	344,540.39	141,634.06
Total	$5,614,097.73	$5,429,585.35	$184,512.38
Grand Total	$468,509,433.61	$459,246,166.92	$9,263,266.69

Note:
The following Securities not included in Balance Sheet Accounts:

Securities Issued or Assumed—Unpledged	$202,500.00	$5,501,500.00	—$5,299,000.00
Securities Issued or Assumed—Pledged	6,925,500.00	7,031,500.00	—106,000.00
Total	$7,128,000.00	$12,533,000.00	—$5,405,000.00

Liabilities	Dec. 31, 1922	Dec. 31, 1921	Increase or Decrease
Stock:			
Capital Stock:			
Common	$82,839,500.00	$82,839,500.00	.....
Preferred	71,800,100.00	71,800,100.00	.....
Total	$154,639,600.00	$154,639,600.00	.....
Long Term Debt:			
Funded Debt Unmatured	$253,044,080.00	$243,447,980.00	$9,596,100.00
Total Capital Liabilities	$407,683,680.00	$398,087,580.00	$9,596,100.00
Current Liabilities:			
Loans and Bills Payable	.....	$70,000.00	—$70,000.00
Traffic and Car Service Balances Payable	$1,368,051.94	1,388,000.29	—19,948.35
Aud. Acc. & Wages Payable	9,335,865.15	8,071,378.78	1,264,486.37
Misc. Accounts Payable	400,556.87	719,448.94	—318,892.07
Interest Matured Unpaid	1,102,869.58	1,071,270.80	31,598.78
Funded Debt Mat. Unpaid.	558,000.00	.....	558,000.00
Unmatured Interest Accrued.	3,308,032.77	3,009,427.11	298,605.66
Unmatured Rents Accrued	292,057.71	284,256.61	7,801.10
Other Current Liabilities	596,022.27	394,980.60	201,041.67
Total	$16,961,456.29	$15,008,763.13	$1,952,693.16
Deferred Liabilities:			
Other Deferred Liabilities	$153,677.70	$125,567.38	$28,110.32
Total	$153,677.70	$125,567.38	$28,110.32
Unadjusted Credits:			
Tax Liability	$2,328,417.94	$2,607,238.57	—$278,820.63
Ins. and Casualty Reserves.	36,606.75	110,179.70	—73,572.95
Operating Reserves	2,767,636.25	2,836,113.73	—68,483.48
Accrued Deprec'n—Equipm't	6,185,529.93	5,130,638.51	$1,054,891.42
Other Unadjusted Credits	1,009,424.36	1,129,009.12	—119,584.76
Total	$12,327,609.23	$11,813,179.63	$514,429.60
Corporate Surplus:			
Additions to Prop'ty through Income and Surplus	$384,489.53	$300,982.62	$83,506.91
Profit and Loss	30,998,520.86	33,910,094.16	—$2,911,573.30
Total	$31,383,010.39	$34,211,076.78	—$2,828,066.39
Grand Total	$468,509,433.61	$459,246,166.92	$9,263,266.69

Note:
The following Capital Liabilities not included in Balance Sheet Accounts:

Funded Debt—Unpledged	$202,500.00	$5,501,500.00	—$5,299,000.00
Funded Debt—Pledged	6,925,500.00	7,031,500.00	—106,000.00
Total	$7,128,000.00	$12,533,000.00	—$5,405,000.00

The Capital Liabilities shown above include the securities issued under the Reorganization Plan for bonds of various issues dealt with by the Plan, including $1,659,500.00 principal amount not acquired on December 31, 1922, which are accordingly not shown as Liabilities.

The company is guarantor jointly with other companies of the securities of certain terminal companies none of which are in default.

[ADVERTISEMENT]

Railway Officers

Executive

Major Graham A. Bell, C. M. G., vice-president in charge of finance and accounts of the Canadian National, will return to his office as Deputy Minister of Railways and Canals of the Dominion government. Major Bell was loaned to the Canadian National Railways under an order in council. Henceforth the office of vice-president in charge of finance and accounts will remain unfilled and these departments will be for time being under the direction of the president of the company.

W. M. Whitenton, who has been elected vice-president in charge of operation of the Missouri-Kansas-Texas, with headquarters at St. Louis, Mo., was born in Texas in 1869. He entered railway service in 1884 as a telegraph operator on the Missouri, Kansas & Texas, and was subsequently promoted to station agent and train dispatcher. He was appointed train dispatcher on the Texas & Pacific in 1890, and was later promoted to chief dispatcher, serving in this capacity until 1898. In this year he was appointed train dispatcher on the Chicago, Rock Island & Pacific, and until 1914, served consecutively as trainmaster, superintendent, general superintendent and general manager. In 1914, Mr. Whitenton became engaged in the work of the Committee of Investigation on Smoke Abatement and Electrification of Railway Terminals of the Chicago Association of Commerce, continuing in this work until the middle of 1915. He was then appointed operating assistant to the vice-president of the Texas & Pacific. He was appointed trainmaster of the Missouri, Kansas & Texas on January 1, 1917, and was later promoted to superintendent and to general superintendent. He was promoted to assistant to the chief operating officer, with headquarters at Dallas, Tex., in March, 1920, and continued in this capacity until the time of his recent election as vice-president in charge of operation.

Financial, Legal and Accounting

C. F. Balch, assistant general auditor of the Chicago & North Western with headquarters at Chicago, has been promoted to statistician with the same headquarters.

E. S. Locke, secretary of the Louisville & Nashville, with headquarters at Louisville, Ky., has been elected treasurer, with the same headquarters, succeeding J. H. Ellis, deceased. **J. C. Michael** has been elected secretary, with headquarters at Louisville, Ky., succeeding Mr. Locke.

E. W. Peabody, who has been appointed secretary of the Missouri-Kansas-Texas, with headquarters at St. Louis, Mo., was born on February 9, 1874, at St. Louis. He was graduated from the University of Chicago in 1896 and entered railway service in January, 1899, on the Macon, Dublin & Savannah. He was employed by the Atchison, Topeka & Santa Fe from 1901 to 1903 and was appointed trainmaster on the San Francisco & Northwestern, which is now a part of the Northwestern Pacific, during the latter year. Mr. Peabody was appointed superintendent of transportation and traffic of the American Railroad Company of Porto Rico, in 1907, returning to the United States two years later to become chief clerk to the general manager of the Western lines of the Atchison, Topeka & Santa Fe. He was later appointed assistant to the general manager of the Western lines, and in 1909 was appointed traveling accountant for the Illinois Central. He was appointed statistician for the Missouri, Kansas & Texas in 1911, and after serving for two years in this capacity was promoted to treasurer. He continued in this capacity during the period of Federal control, and at its conclusion was appointed assistant to the receiver. He was serving in this capacity at the time of his recent appointment as secretary.

Operating

E. R. Swords, trainmaster of the Illinois division of the Atchison, Topeka & Santa Fe with headquarters at Chillicothe, Ill., has been transferred to Emporia, Kan.

F. H. Roberts has been appointed general manager of the Leavenworth & Topeka, with headquarters at Leavenworth, Kan. **J. E. Sissel** has been appointed assistant general manager, with the same headquarters.

E. S. Hill has been appointed acting superintendent of the Southern division of the Kansas City Southern, with headquarters at Texarkana, Tex., succeeding **J. E. Murphy,** who has been granted leave of absence on account of ill health.

W. H. Henderson, trainmaster of the Toledo division of the Pennsylvania with headquarters at Toledo, Ohio, has been promoted to assistant superintendent with the same headquarters. **H. P. Miller** has been appointed trainmaster of the Toledo division with headquarters at Toledo, succeeding Mr. Henderson.

G. Durham, superintendent of motive power and cars of the Wheeling & Lake Erie, with headquarters at Cleveland, Ohio, has been appointed acting general manager, with the same headquarters, relieving **S. Ennes,** president and general manager, and who has given up the duties of general manager on account of ill health.

J. A. Grigware, assistant superintendent of the Toledo-Ludington division of the Pere Marquette, with headquarters at Saginaw, Mich., has been transferred to the Detroit-Canadian division, with headquarters at Detroit, Mich. **W. W. Dyer** has been appointed assistant superintendent of the Toledo-Ludington division, with headquarters at Saginaw, Mich., succeeding Mr. Grigware. **M. M. Cronk** has been appointed assistant superintendent of the Chicago-Petoskey division, with headquarters at Grand Rapids, Mich. **E. E. Clark** has been appointed terminal superintendent of the Toledo-Ludington division, with headquarters at Saginaw, Mich. **C. J. Millikin** has been appointed trainmaster of the Toledo-Ludington division, with headquarters at Saginaw, Mich. **R. G. Archer** has been appointed trainmaster of the Chicago-Petoskey division, with headquarters at Grand Rapids, Mich.

R. C. Morse, Jr., whose promotion to general superintendent of transportation of the Northwestern region of the Pennsylvania, with headquarters at Chicago, was reported in the *Railway Age* of May 5, was born on March 18, 1882, at Cleveland, Ohio. He was graduated from Yale University in 1906 and entered railway service on July 27, 1908, as a yard clerk on the Pennsylvania. He was subsequently promoted to yardmaster and after serving in this capacity for a time was promoted to assistant passenger trainmaster. He was later promoted to passenger trainmaster and held this position until he was promoted to superintendent of freight transportation of the Eastern region, with headquarters at Philadelphia, Pa. In January, 1923, he was promoted to superintendent of the Philadelphia Terminal division, with headquarters at West Philadelphia, Pa., in which capacity he was serving at the time of his recent promotion to general superintendent of transportation of the Northwestern region, with headquarters at Chicago.

Traffic

B. H. Taylor has been appointed commercial agent for the Atlantic Coast Line, with headquarters at Ocala, Fla.

G. S. Wilson has been appointed general advertising agent of the Great Northern, with headquarters at St. Paul, Minn.

A. D. Daniel, purchasing agent of the Atlanta, Birmingham & Atlantic with headquarters at Atlanta, Ga., has been promoted to passenger traffic manager with the same headquarters.

Mechanical

F. R. Butts, general foreman on the Chicago, Burlington & Quincy, with headquarters at Kansas City, Mo., has been promoted to assistant master mechanic of the Beardstown division, with headquarters at Centralia, Ill.

O. E. Ward, assistant master mechanic of the Galesburg division of the Chicago, Burlington & Quincy, with headquarters at Galesburg, Ill., has been promoted to master mechanic of the Alliance division, with headquarters at Alliance, Neb. **H. H. Urbach,** general foreman, with headquarters at Denver, Colo., has been promoted to assistant master mechanic of the Galesburg division, with headquarters at Galesburg, Ill., succeeding Mr. Ward.

George Edward Smart, whose appointment as chief of car equipment of the Canadian National with headquarters at Montreal was announced in the *Railway Age* of March 10, page 593, was born in Edinburgh, Scotland, and entered railway service in August, 1892, in the car department of the Grand Trunk. He held various positions in this department and in 1904 was appointed general inspector of heating and lighting on the Canadian Pacific. In 1906 he was promoted to general car inspector and three years later to divisional car foreman of the Eastern lines of the Canadian Pacific Railway. In October, 1913, he was appointed master car builder of the Canadian Government Railways and five years later was appointed superintendent of the car department. In 1919 he was appointed general master car builder of the Canadian National and in 1920 to mechanical assistant to the vice-president, which latter position he held until the time of his recent promotion.

Engineering, Maintenance of Way and Signaling

J. L. Maher, assistant division engineer of the Connellsville division of the Baltimore & Ohio, with headquarters at Connellsville, Pa., has been appointed assistant engineer of the Pittsburgh division, with headquarters at Pittsburgh, Pa.

H. L. Hunter, division engineer of the Illinois division of the Atchison, Topeka & Santa Fe with headquarters at Chillicothe, Ill., has been promoted to office engineer with headquarters at Topeka, Kan. **T. H. McKibben** has been appointed division engineer of the Illinois division with headquarters at Chillicothe, succeeding Mr. Hunter.

J. W. Webster, assistant engineer of maintenance on the Elgin, Joliet & Eastern, has been transferred to terminal construction work at Joliet, Ill. **V. Benson,** assistant chief draftsman has been appointed assistant engineer of maintenance, succeeding Mr. Webster. **J. Davis,** instrumentman, has been promoted to assistant engineer in charge of double track construction.

T. Lees, engineer of water service on the Canadian Pacific, with headquarters at Winnipeg, Man., has been promoted to district engineer of the Alberta district, with headquarters at Calgary, Alta., succeeding H. Rindal, who has resigned. **C. H. Fox,** division engineer, with headquarters at Winnipeg, Man., has been promoted to engineer of water service, with the same headquarters, succeeding Mr. Lees.

T. E. Nestor, supervisor of track on the Pennsylvania with headquarters at New Brunswick, N. J., has been promoted to division engineer of the Akron division with headquarters at Akron, Ohio, succeeding **R. R. Metheany,** who has been transferred to the Monongahela division with headquarters at Uniontown, Pa. Mr. Metheany succeeds **J. G. Hopkins,** who has been transferred to the Baltimore division with headquarters at Baltimore, Md.

Purchasing and Stores

A. V. B. Gilbert has been appointed purchasing agent of the Atlanta, Birmingham & Atlantic with headquarters at Atlanta, Ga., succeeding A. D. Daniel, promoted.

Obituary

G. Holterhoff, Jr., assistant secretary and treasurer of the Atchison, Topeka & Santa Fe, Coast lines, with headquarters at Los Angeles, Cal., died in that city on May 15.